IGHT, APRIL 14, 1938 FIRST AERO WEEKLY IN THE WORLD

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XXXIII

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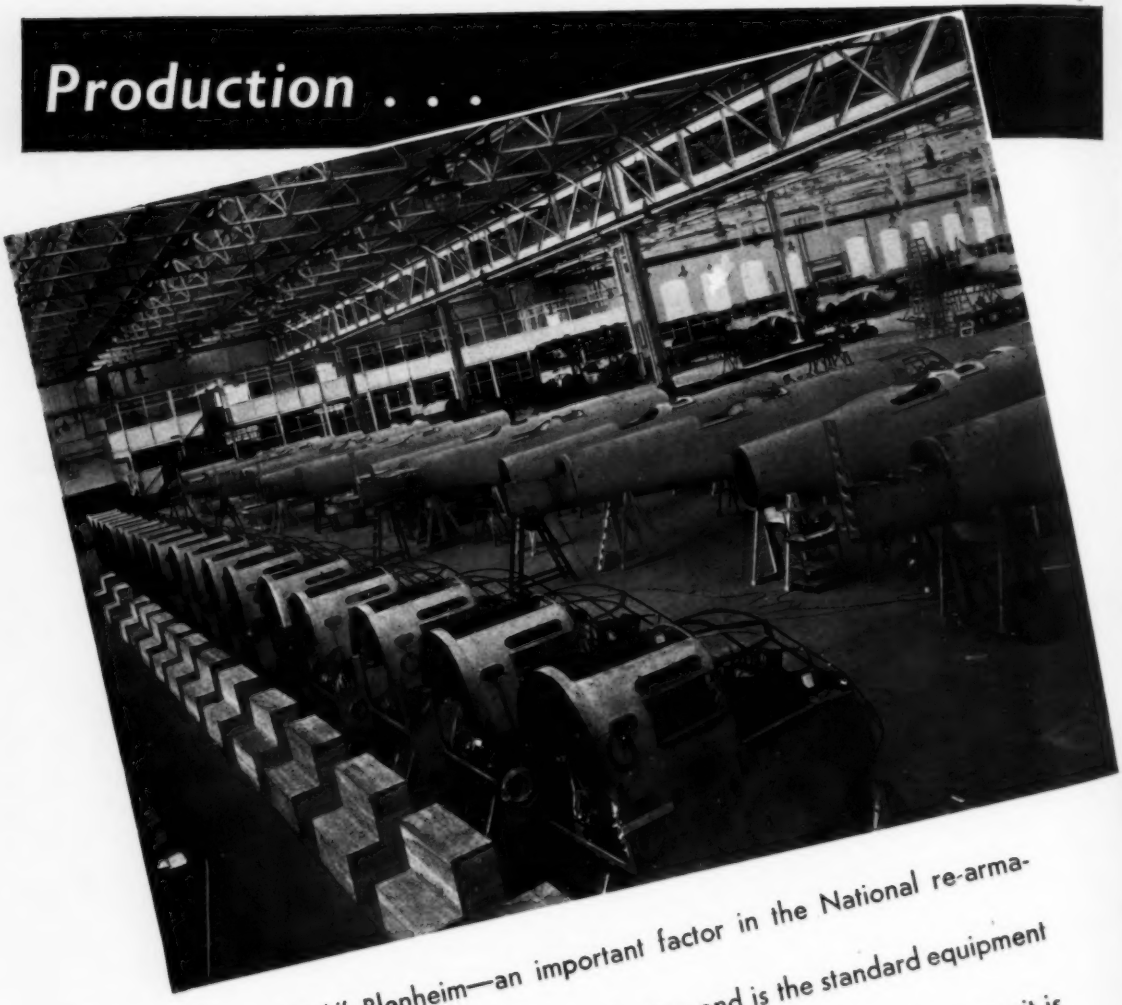

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FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

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The Outlook

Taking Stock

WRITTEN by a man who has had very many years' experience of aircraft production, the article on pp. 358-361 of this issue deserves to be studied closely by every reader, whether directly connected with the problem of aircraft output or merely concerned about a subject which is of vital national importance. The author, for fairly obvious reasons, desires to remain anonymous, but were we able to give his name it would be familiar to everyone in the British aircraft industry. He is able to look upon the matter of aircraft production from the inside, and has therefore had an excellent opportunity for studying the way in which the different production methods have come into being, the success or otherwise of the general "scheme," and the periods in post-war history when we took the wrong turning." In order to give a proper appreciation of how the present position has come about it has been necessary for our contributor to deal briefly with what is now rather ancient history, but we make no apology for reverting to the "stick-and-string" era, which served its purpose well and which still has lessons to teach us, lessons which, as our contributor points out, seem to be in danger of being forgotten.

The outstanding lessons to be learnt from past history are: That the system of design competition has not proved successful, being expensive in money and slow in getting machines into service before they were obsolete or at any rate obsolescent; that Air Ministry materials specifications have gradually become more and more difficult, that the spasmodic nature of orders in the past (up till the expansion period) has had a very adverse effect, not merely on the manufacturers' chances of making a profit, but on getting and keeping good workmen, and that firms have had insufficient opportunity to keep in close touch with the R.A.F. and of learning from the service at first hand the practical experience of the squadrons with any particular type of aircraft.

All these points have been stated by *Flight* at some time or other and reiterated during the past few years, but in the article they are brought into the general picture in a very convincing way.

Another mistake to which our contributor draws attention is in connection with the system of placing orders for certain types of aircraft with firms which did not originally design them. The mistake was not in placing the orders "out," but in letting each of the eight or so firms spend time on getting out its own schedules of materials and design its own tools instead of sectionalising the work and producing only two sets of tools instead of eight. The delay was mainly serious because it prevented skilled toolmakers from getting on with tooling the aircraft which were to come later. Thus when the expansion began, no one, or at any rate only a few firms, was prepared for it.

Of the now-famous I.T.P. (Instructions to Proceed) our contributor states that it was almost eighteen months after the decision to expand that a proper financial basis was agreed upon between the Government and the industry.

Production Shadows

THE author of the article does not have a very high opinion of the two great brainwaves calculated to deal with the expansion problem, the "Shadow Factories" and the establishment of a Directorate of Production at the Air Ministry. He bears out what *Flight* forecast when the shadow factory scheme was first announced, viz., that the shadow production of engines has been reasonably satisfactory because the work was fairly similar to that which these motor car firms had been doing, although it would be idle to deny that an engine specially designed for shadow production, which the one chosen was not, would have formed a more satisfactory subject for "shadowizing" had there been time for such a course to be followed.

On the airframe side the position is far less satisfactory. No single shadow-produced aircraft has yet been flown. The reason of this is twofold. The machine selected for construction in shadow factory No. 1 had not been given sufficient time for thorough testing beforehand, so that modifications have, not unnaturally, been necessary; and the work of airframe construction is so entirely different from motor car manufacture that the firm's previous experience was of little value and an entirely new technique had to be learnt.

What is rather galling to the "parent" industry is that machine tools for the shadow factories were given priority, and the result has been that many of these tools had perforce to remain idle instead of being put to good use in the "parent" industry's workshops. The priority might have been waived with advantage.

THE OUTLOOK (CONTINUED)

Decentralisation

CONCERNING the immediate future, our contributor points out that the present Air Ministry organisation is too unwieldy, the staffs in the various technical departments much too large. He suggests that the firms should be given a much freer hand and that there should be a system of decentralisation such as that which already exists in, for instance, the A.I.D., where district inspectors are in charge and report to headquarters.

Another direction in which our contributor sees eye to eye with *Flight* is in connection with a revival of wooden or mixed construction for certain types of aircraft in which ultra-efficiency is of less importance than quantity production. We have expressed that view on more than one occasion.

R.C.A.F.

IT is not only in Europe that questions of defence have been occupying the attention of Governments and legislatures. The British Dominions are also putting their defences in order. Quite recently the Canadian House of Commons was debating defence estimates which totalled £6,800,000. The Minister of Defence, Mr. Mackenzie, pointed out that by the end of the current fiscal year the Royal Canadian Air Force would have in being ten permanent and twelve non-permanent squadrons, with a total of 224 aeroplanes.

This marks a considerable increase, for at the end of last year the R.C.A.F. consisted of eight permanent squadrons and nine non-permanent ones. The permanent Force consisted of one fighter squadron, one army co-operation squadron, one bomber squadron, one flying-boat squadron, one coastal reconnaissance squadron and two general-purpose squadrons. The non-permanent Force consisted of three fighter squadrons, three bomber squadrons, two army co-operation squadrons, and one coastal artillery co-operation squadron.

Realising that completely harmonious work between the R.A.F. and R.C.A.F. is only possible if both Forces use aircraft of the same patterns, the Canadian Government has placed orders with Canadian firms for a number of modern aeroplanes of R.A.F. design. This is a step which may conceivably have important results. Not long ago it was advocated by a speaker in the House of Commons (Westminster, not Ottawa) that the main part of the British aircraft industry ought to be located in Canada, as factories in Britain might be bombed by enemy aircraft. The idea has attractive features. There would, however, be grave objections to transporting large numbers of aircraft across the Atlantic in time of war.

R.A.A.F.

AUSTRALIA is nearer to one of the disturbed centres of the world than is Canada, and consequently Australian preparations for defence must be more realistic than those of Canada. Australia is intensely interested in Singapore, and the Commonwealth is converting Darwin into a naval base fit to work in conjunction with Singapore. The Royal Australian Air Force is being brought up to a strength which will make it a really formidable partner to the Far East Command of the R.A.F.

Already the personnel of the R.A.A.F. is equal in numbers to the India Command of the R.A.F., and the former is to be increased by 2,780 men, an increase which will make it the most important overseas air power in the Empire. No fewer than nine squadrons are to be added to the muster roll of the R.A.A.F.

Up to the end of last year the R.A.A.F. consisted of eight squadrons, in addition to other necessary units, such as training schools. These squadrons were: one bomber, two general reconnaissance, three general purpose, one army co-operation and one fleet co-operation. The three general-purpose squadrons are organised on a cadre basis, much like the Special Reserve squadrons which the R.A.F. maintained until they were recently converted into Auxiliary Air Force units. That is to say, the commanding officer, the headquarters and one flight are regulars, while the remainder of the officers and men come from the Citizen Air Force. No squadron was definitely termed a fighter squadron, but the general-purpose squadrons, which for some years past have used Demon aircraft, were expected to undertake air combat when necessary. If war were to break out it is probable that the R.A.A.F. would have to go in for more specialisation of squadron work, as the R.A.F. had to do during the course of the Great War.

Acceleration

WITH the all-mail-by-air scheme and, in any case, the introduction of the Short boats on the Empire routes, other equally important features of the Imperial Airways' plan have rather been put in the background. Not only were the number of services to Africa, India and Australia to be increased, but the services were to be greatly accelerated.

Last Sunday, *Centaurus*, already famous for her New Zealand survey flight, left on the first of the accelerated services to Singapore and Australia, in which Karachi is reached in 2½, Calcutta in 3¼ and Brisbane in 9 days. The first of the faster services in the reverse direction left Brisbane on April 5. That from Durban left on April 10 and the outgoing African boat left yesterday.

For the moment, wisely enough, the speeding-up is being done without the introduction of night flying, except that necessary on occasion to maintain schedule. The majority of the crews have still to become entirely experienced in flying-boat work and the ground equipment is, in any case, not yet complete. The present schedule merely shows what can be done with the present fleet and present ground organisation. With even larger and more commodious boats, with crews experienced over a number of years, and with thoroughly efficient ground organisation it will be both possible and reasonable for the passengers to be flown by night and by day.

The Bombing of Barcelona

THE accounts of the carnage wrought by the bombs dropped on Barcelona last month make absolutely sickening reading. They recall the awful occasions in the wars of the Middle Ages when conquering armies were sometimes deliberately let loose in captured cities to plunder and ravish at will, in the vain hope that such punishment would dissuade other cities from resisting. The frightfulness never had that effect on any virile people, but rather made the resistance of the others all the stiffer. One wonders whether the generals of modern Spain and the airmen whom they employ would be ready to lead their soldiery on to the slaughter with rifle and bayonet of the civilians in the towns which oppose them. One can hardly think so; and at the same time one must admit that the worst horrors of air bombardment cannot equal the atrocities which have at times been committed by drunken and undisciplined troops.

Still, the tales which come from Barcelona are gruesome enough, and they almost dispel the belief that the world had advanced in humanity and in Christian practice since the Renaissance. The chief marvel is that people are to be found, even among our British selves, who will argue that war is now a war of populations, and that therefore the bombing of civilians is a legitimate operation of war. If such people could produce any evidence that the frightfulness has produced, or is likely to produce, a demand for surrender by the tortured populace one might have to listen to such arguments. But all the evidence is on the other side.

DIARY OF FORTHCOMING EVENTS—PAGE 371

ASSISTED TAKE-OFF: the MOVING AERODROME

A Fairey Swordfish torpedo spotter reconnaissance machine (690/750 h.p. Bristol Pegasus III), taking off from the *Courageous*, turns almost immediately the wheels are clear of the deck in order to clear the way for the next man off. The steam jet, which shows when the ship is headed dead into wind, is in prominence.

PRODUCTION

A Critical Examination of Present Methods of British Military Aircraft Manufacture, and of the Past Methods which Led Up to Them : Some Constructive Suggestions.

By A PRODUCTION ENGINEER

IT is generally agreed in aeronautical circles that the smaller firms, in particular, have suffered from lack of appreciation and forethought on the part of various politicians—politicians who are responsible for the fact that this country is behindhand with the design and production of military aircraft, most especially in the design and manufacture of airframes rather than engines. Let us look a little more closely into the matter, taking the history of military aircraft production during the last 25 years as our starting point.

Prior to the last war, aeroplanes had been used on the Army manœuvres, but the authorities thought of them only as means of observation, not as offensive weapons, so that when the war started in 1914 such aeroplanes as existed were not equipped with guns, cameras, bomb gear, etc. As the war proceeded, the necessity of turning aeroplanes into fighters and bombers became apparent, and new designs embodied the requisite equipment. The machines were of simple construction, being made of wood, steel plates, wire, and fabric; deliveries of production orders of new types could commence in about six to eight months from date of conception. The extensive use of wood enabled a very large number of wood-working craftsmen to be utilised.

The Air Ministry technical and inspection staffs were engaged from outside industries. They were not hidebound by extensive specifications and regulations. They were allowed to use their own common sense. They were willing to work hard and help to obtain high-pressure production in the works to which they were posted.

Labour per aircraft was much smaller than it is with modern machines; the work was simpler and not to such a high standard; more unskilled and semi-skilled labour could be used. Moreover, if a part was not 100 per cent. perfect workmanship, but was safely passable, it was used and not scrapped.

Shortage of engines, instruments, A.G.S. parts, etc., did occur, and eventually production officials were posted to the various works. Their duty was to progress such supplies, and the scheme worked very well. Also, there was centralised control of the distribution of materials and plant, so that these items were sent to works where they were most wanted.

To-day, so many of the lessons learned then appear to have been forgotten. However efficient a firm's production manager may be, he cannot make real use of his ability unless he has adequate supplies of labour, plant and materials, and the loyal help of the Air Ministry staff stationed at his works.

After the war, the Government of the day decided to cut down expenses to a minimum. Contracts were cancelled, private and national factories were closed down, plants and stocks sold, staffs and workpeople disbanded. Many firms went out of the aircraft industry. A few stayed in and shareholders lost a lot of their capital.

Later, small reconditioning contracts were issued to firms to help them to keep going, and the system of design competition came into being. In its early days this system turned out to be a further drain on the resources of the industry, in that the sums spent by the industry in new designs was, in the aggregate, much larger than the possible profits from any contracts obtained.

This system has never given good results. Between the time when the Service put forward their views as to the requirements of a new type and the time when the type had been produced in sufficient quantities to equip Service units, a period of four to five years sometimes elapsed.

Later, larger contracts were issued as the old war-time stock was used up, and some firms began to make profits, but it is a fairly safe generalisation to make that at no time up to the expansion period were more than a third of the firms in the industry able to make profits. The majority of the profit-makers belonged to the larger groups, who were able to exercise greater influence. It is obvious that the smaller firms had a very thin time between years 1918 and 1935.

During this period the technical and inspection staffs at the Air Ministry constantly added to their requirements and restrictions. The type of construction changed mainly from wood and fabric to metal and fabric. Materials specifications were so tightened up that materials became almost impossible to buy. Every accident or failure in the Service brought new restrictions, thereby slowing down design and production, so that by the time the Service were equipped

This Article Maintains that—

NOT until some three years after expansion started did the Government approach Organised Labour to assist them.

The present Air Ministry organisation is unwieldy and the staffs much too large.

The aircraft industry should be allowed to think for itself and anticipate its customers' requirements

Air Ministry technical, production, contracts and costing departments should be decentralised into areas.

The principal designing firms should be allotted types on which to specialise, and should be allowed direct contact with Service units using them.

For certain duties wooden aircraft, manufactured by non-specialised plant and labour, could be easily, quickly and cheaply produced

—what is WRONG?

with new types, the design was obsolete.

The shortage of orders during the earlier part of this period was such that a large number of the firms had to reduce their technical staffs and numbers of workpeople to an absolute minimum. They were unable to take apprentices, and practically no new brains were attracted to the industry. Later, some slight improvement was effected by the placing-out of manufacturing contracts for small numbers of Siskin fighters, the policy being to compensate the designing firm and to issue tenders to all the firms in the industry. To obtain a contract of this kind firms had to quote prices which were virtually no more than a contribution to overheads.

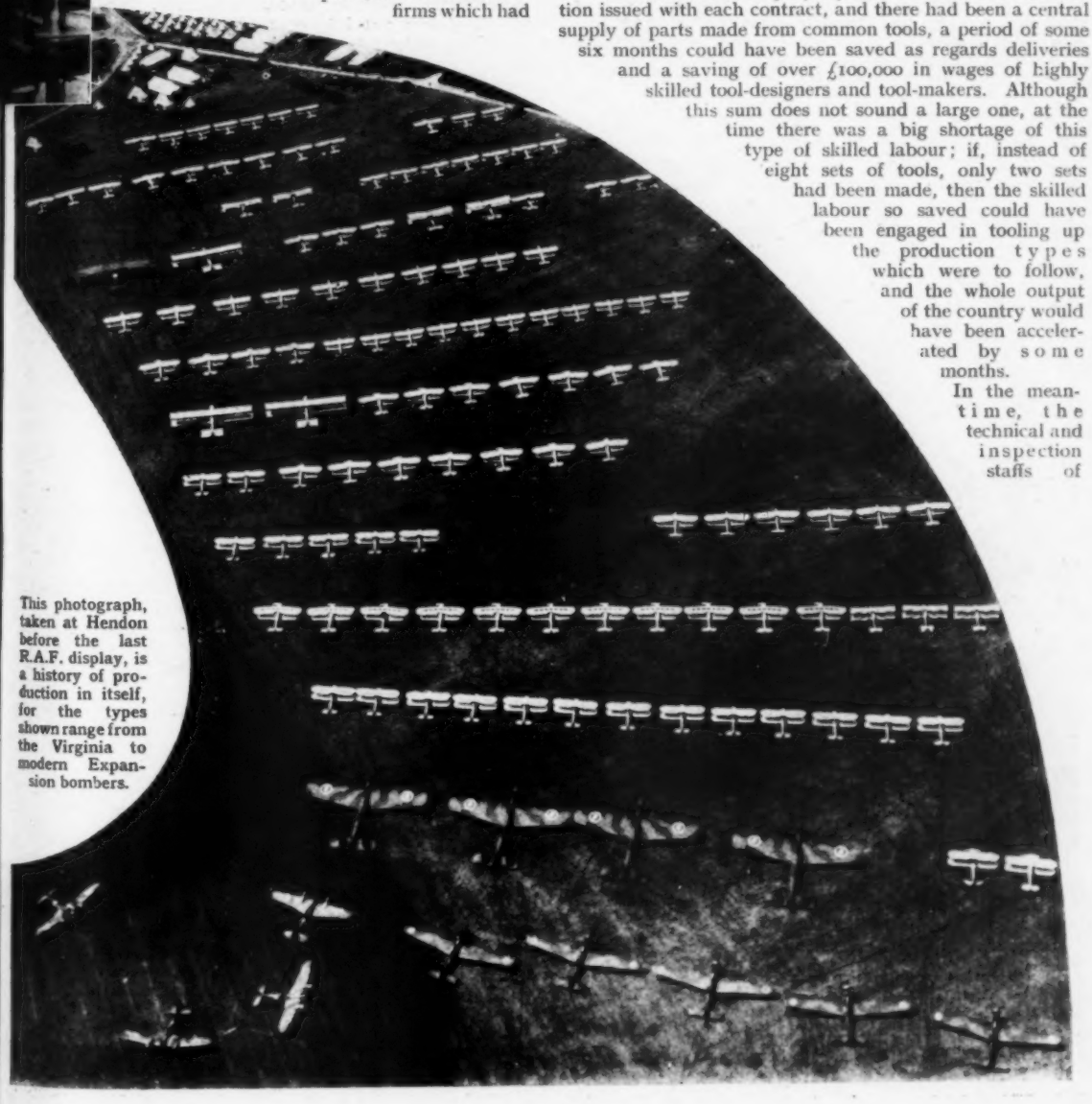
Thus the industry, at the period just prior to the decision to expand, consisted of a few firms which had been lucky with their designs, and the majority which were not lucky had had their staffs, workpeople, manufacturing and cash resources reduced to a minimum.

The present Minister for Air, then new to his task, apparently knew nothing of modern aircraft, of the technical and manufacturing problems, or of the industry and the troublesome times it had gone through.

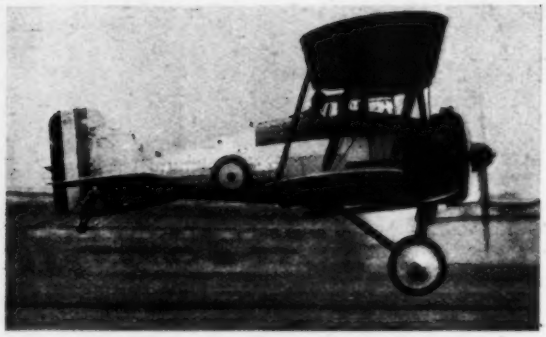
Having decided on an expansion of the Air Force, the Air Ministry proceeded to place production orders with the industry. A few firms, fortunate in that they were already in production of types of their own design, were easily able to increase their output. To other firms tenders were issued for the construction of the Hart type and its variants. This class of contract was placed with about eight firms, mostly at prices which merely showed a contribution to overheads. Copies of the working drawings were the only information supplied, and each firm had to prepare its own schedule of materials required and design and make its own tools.

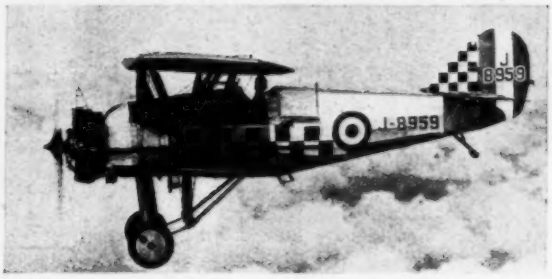
If the work had been properly sectionalised, full information issued with each contract, and there had been a central supply of parts made from common tools, a period of some six months could have been saved as regards deliveries and a saving of over £100,000 in wages of highly skilled tool-designers and tool-makers. Although this sum does not sound a large one, at the time there was a big shortage of this type of skilled labour; if, instead of eight sets of tools, only two sets had been made, then the skilled labour so saved could have been engaged in tooling up the production types which were to follow, and the whole output of the country would have been accelerated by some months.

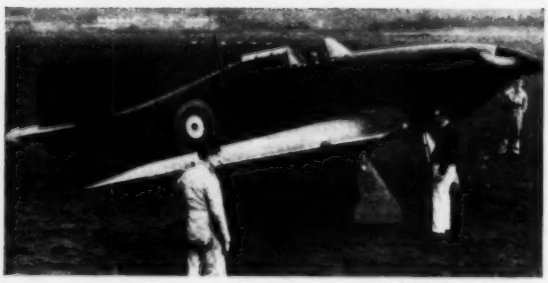
In the meantime, the technical and inspection staffs of



This photograph, taken at Hendon before the last R.A.F. display, is a history of production in itself, for the types shown range from the Virginia to modern Expansion bombers.







"Flight" photographs

Some milestones in production: From top to bottom are the Gloster Gamecock—last of the wooden fighters in service; the metal Siskin; the Gladiator, probably the last of the metal biplanes; and the Hurricane, which, although one of the fastest military aircraft in the world, is fabric-covered.

the Air Ministry had to be enlarged to deal with the bigger programme. The additional staffs were partly obtained by offering individuals in the industry greater inducements than their firms were able to give them, thus depleting the staffs of the firms and making it still more difficult for them to get going with their production.

Towards the end of the first year of the expansion period it became obvious that the output of aircraft was nothing like so large as had been hoped for and scheduled. No real investigation or consultation with the industry was made to discover and remedy the difficulties, but the officials of the firms were bullied and told they did not know their jobs because they were unwilling to enlarge their works, increase their plant, and spend large sums of money without having any proper guarantees as to contracts over a period of years. It was not until about eighteen months after the decision to expand that a proper financial basis was agreed between the Government and the industry. During this eighteen months two brain-waves emerged from the Air Ministry: (1) to start shadow factories; (2) to create a production department. The shadow factory scheme consisted mainly of two sections. One group of factories was to make units for a particular size and type of engine. In this case representatives of some of the larger motor car manufacturers were called together and asked to produce a scheme. The plan they produced was put into operation and has worked fairly well, although it is not properly balanced in that some firms, being too far ahead of others, have had to put their workpeople on short time.

Unfamiliar Work

In the second section of the scheme, two of the large car manufacturers were asked to put down shadow factories for the purpose of building airframes. A particular design of aircraft was allotted to each of these factories, a new factory building erected, plant ordered, etc. According to statements in the Press, the first airframe should be delivered out of No. 1 Factory towards the end of this year, and the first out of No. 2 Factory some time in 1939—some three years after the shadow factory scheme was decided on, and certainly a year longer than it should have taken had the work been planned properly.

Incidentally, about the time that the shadow factory scheme was evolved, a number of firms were hauled up individually before the Minister of Air, who slated them for the delay in output. They pointed out their difficulties with regard to finance, supplies of labour, materials, plant, and so forth.

As previously stated, some six months after these interviews satisfactory arrangements were made with regard to finance, but practically nothing was done to assist firms with regard to supply of labour, materials and plant, and it was not until early this year, some three years after the expansion started, that the Government approached Organised Labour to assist them with the scheme.

The arrangement regarding the shadow factories having been made some months prior to the finance arrangements referred to above, the industry found that when they wanted to purchase certain machine tools in this country they would have to wait many months, as the shadow factories had booked all immediate deliveries; actually, many of these machine tools were delivered to shadow factories and stood idle for some months, whereas, if they had been allotted to the existing factories, they could have been put into production work straight away. The matter was taken up with the Air Ministry, but the reply was that the shadow factories had to have priority.

The formation of a production department at the Air Ministry was undoubtedly a step in the right direction, but again it was a good idea mismanaged. It is essential for the staff of such a department to have experience in the technical and production problems of modern aircraft; they should be able to help the firms with constructive suggestions, supplies of labour, plant, materials, equipment; they should be able to guide and advise the technical, inspection, and contracts departments at the Air Ministry to ensure that the actions of these departments did not in any way increase the difficulties of the firms.

It would have been far more helpful to the industry if

the staff of this new department had been drawn from the existing three departments referred to above. They would have been familiar with the problems involved, and have known the various works and personnel; the production department's present staff, in their ignorance, and with probably the best of intentions, have been an embarrassment and hindrance to the various firms' officials, taking up their time and generally adding to their difficulties.

The present Air Ministry organisation is unwieldy and staffs are much too large, especially in the technical and inspection departments. These should be reduced, and some responsibility and a freer hand given to the firms in the industry. The firms should be allowed to have some direct contacts with the actual users of their products; they would then be able to anticipate requirements, deal with defects quickly, and take a more lively interest in producing the best possible aircraft for a given job. Imagine a motor car firm not being allowed to anticipate the requirements of its customers, but instead, having to wait until the customers had put forward their views through various channels to some central body, which, say a year later, issued a specification of such requirements to the firms concerned, and asked them to produce a design for criticism; then another a year later, placed an order for experimental motor cars! By this time most of their customers would have deserted them and be using foreign cars.

The control of the Royal Air Force and the A.I.D. is to a large extent decentralised. The existing technical, production, contracts, and costing departments should also be decentralised.

Area Administration

A qualified and experienced industrial engineer should be put in control of these departments in London, with only a small supervising staff. The country should be split up into areas, with an assistant chief engineer in charge of each area having full control over the area staffs of each of the departments referred to above. Decisions regarding the placing of all major contracts would be made in London and the areas instructed accordingly, but each area H.Q. would deal with all questions regarding contracts, production, inspection, etc., and a considerable amount of time and expense would be saved to the Air Ministry and the firms concerned.

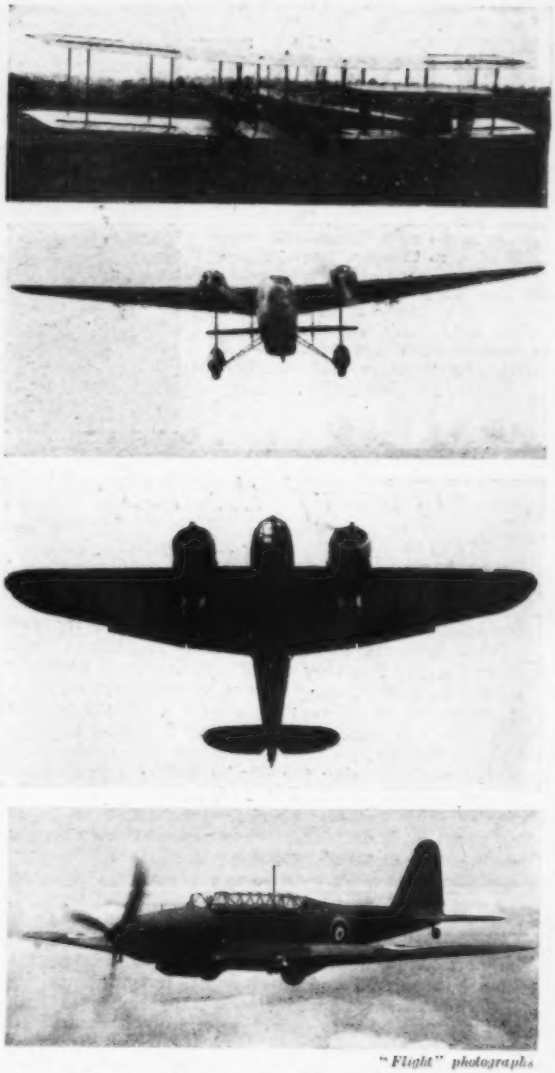
A comparison of results obtained in the various areas could be used to keep the staffs on tip-toe; it would create a spirit of achievement, and promotion could be based on results obtained rather than by seniority and ability to avoid responsibility.

An advantage of decentralisation is its flexibility in expansion and contraction, and it would be less liable to disorganisation in time of war. Moreover, the staffs attached to an area would know the facilities and personnel of the firms in their area more intimately than under the present organisation.

The only specialisation with regard to design is that certain firms concentrate on aircraft for naval purposes as distinct from land-based aeroplanes. As time goes on it appears obvious that designing firms must specialise more and more if the most efficient types are to be produced. The principal designing firms should be allotted types on which to specialise, and their technical staffs should be allowed direct contacts with the Service units using these types. The firms cannot use the aircraft themselves under Service conditions, therefore it is essential that they obtain direct the views of the trained and intelligent user of their products if the maximum efficiency is to be obtained.

It is thought to-day that the maximum efficiency for high-performance aircraft is obtained by the use of the metal stressed-skin monoplane type, but there are still a large number of duties for which the maximum efficiency is not necessary, and if such aircraft could be constructed in wood a much larger field of manufacturing plant and labour could be used. The cost is lower with a larger output per man power, and early deliveries result; also, output per unit of factory area is higher.

A plentiful supply of good labour is the keynote to efficient production. In the pre-expansion period a few aircraft firms were working without overtime and night shifts to approximately maximum capacity; others were only working to about 10 to 20 per cent. This meant that in the case of the latter firms the bulk of their labour had either drifted into other industries or had left the district. It is an exceedingly difficult matter suddenly to increase your labour from five to ten times; you cannot get the old labour back and the new labour has to come out of the unemployed who, generally speaking, are the least efficient workers in the district.



"*Flight*" photographs.

More production milestones: The Vickers Virginia (top) was produced in wood and metal. Reading down are the Handley Page Harrow, now in service; the Blenheim; and the Battle. The two last are typical modern stressed-skin types.

The supply of trained labour should be one of the first problems considered when an emergency period approaches. Factories situated in country districts should be kept as fully employed as possible during slack times, even if firms in big labour districts are short of work. Once the country factory loses its men through shortage of work, they leave the district in search of fresh work, it is very difficult to get them back.

Every effort should be made to keep the flow of work in a factory going year in and year out at as near a uniform rate as possible. It has the most demoralising effect on a steady, reliable man to know that he is likely to be stood-off in a couple of hours if some hold-up in production or reduction of orders occurs. Good, loyal, contented, well-trained labour is essential to efficient aircraft production.

PRIVATE FLYING

MIDLANDS CENTRE : The terminal building and hangar at the new Wolverhampton aerodrome—with a small portion of Mr. J. R. Bryan's Reliant in the right foreground. The Midland Aero Club are providing the club flying facilities there, while Boulton Paul already give a manufacturing atmosphere. The latter's works, incidentally, make an excellent landmark when the aerodrome is being approached in poor visibility. (*Flight* photograph.)

Topics of the Day

Gale Flying

A FEW weeks ago I recorded some amusing and instructive effects which were noticed while making approaches in a very strong wind, and I thought then that the indicated air-speed variations were just about as great as they could have been. A fortnight or so later I obtained some even more grotesque readings while coming in to an aerodrome over a factory on the windward side of which was obviously a region of comparatively quiet air.

On this particular day the wind speed at ground level was about 25 m.p.h., while at 2,000ft. it was blowing at 45 m.p.h. This last was checked on an up-wind flight lasting about an hour. There were such obviously terrific variations in wind speed near the ground that I brought the machine in at more than 70 m.p.h. on the clock, and yet on two or three occasions this speed was reduced, almost without warning, to very little more than 50 m.p.h. in the aforementioned area.

The personal feeling, of course, was simply that the machine had entered a down-draught, but the carefully watched indications showed clearly that the wind had, in fact, dropped by very nearly 30 m.p.h. It seems that much of this down-draught business is a myth, and that what really happens is that the wind-flow over a certain part of the approach is being blanketed either by a hillock or by some building or other. There is no real distinction between one's impressions when a machine is very near the stall or when it is being actually forced earthwards by a down-draught.

Essential Care

HOWEVER, the real point of all this is that one cannot be too careful in such conditions, since the loss of essential air speed between gusts can be very marked and very sudden. If there is plenty of available height one can ignore the air speed variations, but during the last part of an approach a loss of speed may cause the machine to sink in rather heavily.

During the take-offs from the same aerodrome and on the same day I noticed that at a certain point and at a certain height the machine gained something like 200ft. in a few seconds, and that the air speed tended to rise very rapidly. The suggestion here is that much the same sort of thing is happening in the reverse order, and that the machine was actually climbing out of a comparatively slow-speed wind layer into one of considerable force.

It has always seemed to me that the wind must tend to blow in almost symmetrical layers, and when you think about it this seems to be rather natural, since ground obstructions of various kinds would, in addition to providing really man-sized bumps, tend to slow up the entire airflow below a height roughly equivalent to that of the tallest obstructions in the district.

Needless to say, the only really difficult part of the flying business in such conditions is that of controlling a machine on or near the ground. On the ground if there is any appreciable side area aft of the undercarriage it is most difficult to prevent the machine from swinging into wind all the time. This is where the present-day idea of braking control rather comes adrift, since in order to hold the machine across wind it is necessary to use so much braking power on the leeward wheel that the brakes are, in effect, hard on and taxying can only be done at about half-throttle. A process which seems to be very like ill-treatment both of the tyres and the engine.

Such conditions are not very usual, otherwise I might suggest a return to some more positive form of steering tail-wheel, though it is doubtful whether a mere steerable tail-wheel would provide one with sufficient steerage power.

It would be interesting to see what would happen to the conventional tricycle arrangement, both of the steerable and castoring types, in strong winds. With the ordinary castoring tail-wheel, the particular machine which I was flying would, from about five miles an hour, swing itself into wind and even correct itself, through perhaps ten degrees, after over-swinging. So there was no real need to look at the wind-sock.

Lost

ONE of the many curiosities of *ab initio* instruction seems to be that almost whenever a pupil gets himself lost he is always to be found in a field pretty well directly to the leeward either of his proposed destination or of the last landmark which he later mentions as having recognised. The other day an instructor told me that, in his experience, this was practically a hard-and-fast rule.

The only reason I can suggest is that when a novice is lost he feels that he is making more satisfactory progress towards some unknown goal if he is flying downwind. Of course, even if a pilot was scouring a district in search of a usable landmark the wind would be steadily blowing him away from his starting point, and if he spent even a quarter of an hour in making such random search circuits he might drift as much as eight or ten miles to leeward.

The golden rule when lost, I am told, appears to be to fly upwind whatever happens, though presumably if, after a little stratosphere flying, a pilot finds himself over the North Sea he must use his own judgment in the matter. Nevertheless, even in such circumstances the rule can be logically applied in four out of five cases. Obviously, if fuel is to be conserved while land (or some steamship) is to be discovered, the obvious direction in which to fly is upwind, since it will otherwise take you at least half as much time (and fuel) again to return to the original position.

I should hate it in any case. To be out of sight of land on a day of heavy haze over the Wash or the Bristol Channel is quite depressing enough, even when I know perfectly well when and where land is next due to appear—mathematics being furiously checked if this land is half a minute late in its appearance.

INDICATOR.

FROM the CLUBS and SCHOOLS

HAMPSHIRE

THE total flying time for the week ended April 8 of 50 hr. 35 min. included 3 hr. 30 min. night flying. Night flying instruction is being taken by Dr. R. W. A. Simmons and Mr. G. H. Winn and Mr. G. H. Jackson made his "B" licence night flight from Croydon.

SOUTHEND

Over 12 hours were flown on Sunday, April 10, under ideal weather conditions. A dance has been arranged for Easter Monday. The dance held on April 9 was a great success.

REDHILL

Fifty-one hours were flown during the week ended April 8 and new members were well in evidence. Five machines participated in the Brooklands Dawn Patrol on April 3.

BARTON (BEDS)

The light evenings are tempting several new members to the Bedford School of Flying, especially from Vauxhall Motors. Miss Molly Prime and Mr. John Prime signed up last week.

LONDON

A first solo flight was made by Mr. M. Setcanu and the flying time for last week was 56 hr. 15 min. Three new members—Messrs. E. L. Tanner, D. Stansfield and P. Stansfield—joined. The club will be closed from sunset to-day until 10 a.m. on Tuesday, April 19.

READING

Of the two machines which went to the Dawn Patrol at Brooklands one was flown by Mr. Dash, who was fortunate in securing a free breakfast. Nine visiting aircraft visited the club on Sunday night. Mr. Townsend has completed his "A" licence tests.

NORTHAMPTON

Last Sunday seven machines flew to Brooklands Flying Club, where passengers and pilots were warmly welcomed and entertained to tea. New members include Messrs. J. M. Truelove, B. C. Howard and the Rev. K. C. Norwood.

C.A.S.C.

The good weather last week-end resulted in an increased flying time of 13 hours. The cross-country trip to Maylands Aerodrome, which had to be postponed last week, took place. Mr. E. K. Gabb made an instructional navigation flight with a senior member from Hanworth to Cardiff and back.

BORDER

During the last few weeks there has been a notable increase in the number of aircraft using Carlisle and there is every indication that this summer will see the airport busier than it has ever been before. Flying was again handicapped by strong winds and for the week ended April 8 only 23 hr. 50 min. have been flown.

SOUTH COAST

A very successful fancy dress dance was held at the South Coast Flying Club on Saturday, April 9. Over 80 members and friends attended, the majority being in fancy dress. During the evening the presentation of the trophy given by Messrs. Gorringe was made to Mr. L. Gilson. Medals were also awarded to Messrs. A. G. Head and J. A. Frampton for 2nd and 3rd places in the Gorringe cross-country handicap. Mr. F. C. White also handed over his Club Championship Cup to the club and Mr. Pashley received it from him.

YORKSHIRE

With the improvement of the weather, and cross-countries to Chorley, Preston and Doncaster, the club has been able to put in 29½ hours for the month. Mr. D. H. Greaves has received his "A" licence. Preparations are in full swing for Empire Air Day and it is hoped there will be a large attendance to justify them.

CINQUE PORTS

The luxuriously appointed seven-seater Short Scion was fetched from Rochester on April 4 and is already in use for night flying. Mr. Tom Hackney took Messrs. Drewery and Benyon to Paris on Sunday, and returned on Tuesday. Mr. C. G. Bryan flew from Egypt with the dual purpose of seeing the Boat Race and renewing his "A" licence with the club.

MARSHALL'S

The club flying times at Marshall's Flying School for the week ended April 10 totalled 60 hours. Cross-country flights were undertaken to Gloucester, Lympne, Croydon, Hamble and Romford. Mr. G. L. Panes completed the final cross-country flight for his "B" licence and Messrs. De Roeck and Symington carried out their first solos.

BOURNEMOUTH

Although the rough winds experienced the Sunday before last prevented the club's attendance at the Dawn Patrol at Brooklands, cross-countries have been possible during the week and visits have been made to Shanklin, Hayling Island, Salisbury and Croydon. Mr. F. Sparrow obtained his "A" licence and Mr. C. E. Kilner made his first solo.

HERTS AND ESSEX

Six machines attended the Dawn Patrol at Brooklands, but the occupants of only one obtained free breakfast. Serious flying was rather inconvenienced by high winds during both week-ends of the fortnight ended April 7, but a total of 103 hr. 57 min. was recorded. During March a total of 309 hours was logged. Messrs. Kearney and Sanghvi completed the "B" licence night flights and Mr. Geoff. Parbury obtained an instructor's endorsement to his "B" licence.

BOMBAY

The Bombay Flying Club put in 204 hr. 15 min. for the month of March, including 1 hr. 10 min. night flying. Cross-country flights were made to Junagadh, Porbandar, Himatnagar, Jodhpur, Bikaner and Indore. Messrs. L. C. Fabjan and D. P. Majoo obtained their "A" licences and Mr. B. B. Nicholson obtained his Indian Pilot Instructor's Licence. A competition for the Dewar Challenge Cup was held on March 27, which was won by Mr. P. C. Ramachandran, who will hold the cup for the forthcoming year.

BROOKLANDS

The monthly competition fixed for Sunday next has been postponed for one week owing to the incidence of the Easter holiday. Six club machines paid an official luncheon visit to the London Air Park Flying Club on the Sunday before last, making a call at Reading *en route*. The four Tiger Moths flew in diamond formation all the way. Later in the day seven aircraft from the Northamptonshire Aero Club flew in for tea. Mr. Tom Brooke-Smith, aged nineteen years, has obtained his "B" licence, and believes himself to be the youngest professional pilot in the country at the moment. The wedding of Mr. Roland Morris and Miss Hilary Hollom took place on Saturday last, and a formation of club aircraft flew over the church as the bridal party left.

Engines in the Ballroom

EXHIBITION aircraft engines lent by the Bristol Aeroplane Company, including an Aquila and a Perseus, and an electrically lit, sectional, working Pegasus, formed part of the decorative *motif* at the Bristol and Wessex Club's annual Aviation Dance at the Victoria Rooms, Clifton, last Friday.

Some 250 members and their friends enjoyed the fun, which included an oyster bar, the raffling and subsequent auctioning of an outsize bottle of champagne in aid of Club funds, and a cabaret appearance by Mr. Albert Whelan.

Government and Clubs: R.Ae.C. Deputation

MR. LINDSAY EVERARD, M.P., chairman of the Royal Aero Club, and Cdr. H. E. Perrin, secretary, representing the Club, the General Council of Associated Light Aeroplane Clubs, and the British Gliding Association, were given an interview by the Under-Secretary of State for Air last Thursday.

They pointed out that the light aeroplane clubs were suffering from the severe competition of the R.A.F.V.R. schools, and urged the use of such clubs throughout the country for the purpose of giving week-day elementary flying instruction to the accepted R.A.F.V.R. candidates waiting to commence their training. The effect of the R.A.F. expansion scheme had been to absorb nearly all the available supplies of trained flying and ground personnel, with the result that the clubs were called upon to pay increased salaries in order to retain their instructors. To meet these increased charges it was essential that the present subsidy should be increased.

They also asked that Colonial and Dominion members of flying clubs should be allowed to come within the subsidy scheme.

As regards Army co-operation flying, it was pointed out that selected "A" licence pilots were well qualified to fly for daylight defence practices.

The question of a government grant to private owners towards the maintenance of their aircraft was discussed, and a proposal for such assistance was submitted.

The question of the gliding movement in this country was reviewed and a strong plea for increased subsidy for the next two years was put forward.

Hospitality at Hayling Island

FLYING people spending their Easter holidays around the South Coast may care to note that they can land without fee at Hayling Island Aerodrome, which is small, but has good approaches. The aerodrome is operated by Air Transport and Sales, Ltd., who have two hangars there, and have a number of second-hand aircraft for disposal. Yachting enthusiasts are also catered for with moorings alongside the aerodrome.

Mr. Morgan Harris is managing director. The company has a London office at Station Road, Edgware (Edgware 1468). The Hayling Island number is Hayling 77514.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

INITIATIVE

Appreciation of a Control Officer's Co-operation

I SHOULD like to bring to your attention the way in which the Traffic Control Department at Croydon went to a lot of trouble to help an ordinary private pilot out of an awkward situation the week-end before last.

I flew to Brussels on the Saturday in a Monospar and when I was clearing for the return journey on the Sunday the Belgian authorities discovered that I had an expired licence. (This error arose because I had the two licences together in a desk, and picked up the wrong one.) They refused to let me leave. (Time, 11.30 a.m.)

It being Sunday I was in rather a quandary as to what to do, and my first effort was to telephone Croydon Traffic Control Office and ask if they could wire a release. The officer there said he did not know what he could do, but he would try to do something. Within half an hour I obtained a reply by wire to say that my licence would be on a Sabena machine reaching Brussels at 4 o'clock.

Whilst telephoning I mentioned that the licence was in my desk at General Aircraft, Ltd., but my immediate hope was that there might be a list of licenced pilots at Croydon, and that he could check up on this; but it appears that, acting on his own initiative, the officer in question got in touch with my firm, my licence was found and rushed off to Croydon, and in little over four hours it was in my possession.

Delay until Monday would have resulted in an unfortunate dislocation in our programme, as the machine was due to leave on another mission.

Feltham. D. L. HOLLIS WILLIAMS, Chief Engineer, General Aircraft, Ltd.

RESTRICTED "A" LICENCES

—and Unrestricted

IN your correspondence columns on March 24 Mr. McKee suggested that every club or school should possess an "ultra-light" aeroplane for certain classes of instruction. The following week "P.T." drew attention to the restricted "A" licence available to members of the Ely Aero Club trained by the ground-hopping method on Drones.

May I further direct the attention of your readers to the fact that an *unrestricted* "A" licence, obtained by orthodox modern, cabin, side-by-side dual instruction in an average of about seven hours, is available at £12 10s. at the associated airports of Ramsgate, Ipswich, Exeter, Plymouth and Weston-super-Mare. The aeroplanes used are Hillson J.A.P.'s—genuine ultra-lights—and since their introduction a month ago, over thirty pupils have enrolled for training on them.

London, W.1 WHITNEY STRAIGHT.

ASKANCE AT THE BOMBER

A Plea for Conversions

RECENT international events, and a paragraph in your Editorial for March 3, 1938, have urged me to write this letter. You probably will not print it, still, here goes: This paragraph stated, ". . . a standard British bomber, already in service in very considerable numbers, is as fast as, if not faster than, several of the new Continental twin-engined prototypes." This gives "cause for elation."

Now, why? As a resident very near one of our biggest aero factories and a possible corpse in the next war (which looms steadily nearer), I don't feel it, and this is why:—

(1) There are too many bombers! If war broke out tomorrow (probably without an official declaration) where should we stand? We should find ourselves equipped with an air force consisting largely of fast medium and heavy bombers, with defence forces of semi-obsolete 250-m.p.h. biplane fighters with mostly two machine-guns, and one squadron only of up-to-date machines.

(2) From the way the expansion programme is taking effect, it seems that the fast bomber is considered very important, if not the most important.

(3) This attitude is prevalent among foreign air chiefs.

(4) We thus arrive at the "You bomb me and I'll bomb you" stage. Apart from the ethics of mass murder of innocents (probably your family or mine, Mr. Editor), I maintain that this is anathema to the civilian population in any country. Recent minor (?) wars have shown the utter callousness and ruthlessness possible by the users of bombers.

I feel strongly that it is high time that the attention of our air chiefs was diverted to a different type of warplane. What 80 per cent. of people in this country want is something to stop bombers besides A.A. guns and balloon aprons (we can't apron the whole country, anyhow!), and I suggest that this aspect has been seriously neglected. If only some of our fast bombers were converted to fighters with *canons*, I should feel more satisfied. One squadron of Hurricanes is not enough! Where are the other monoplane fighters of which we have read?

(6) Has the twin-engined attack machine received due attention by British designers? The Fokker G.1 sounds a useful type on the right lines (I seem to remember that Fokker produced a useful type once before, to our discomfiture!).

(7) To show that this is not just destructive criticism, I am begging and pleading that (A) at least half the Blenheims being produced be converted to heavily armed attack machines; (B) the Hampdens be made fighters only and a good supply provided (I mean hundreds!); (C) Some of the other bombers could be converted, such as the Battle or the Wellington; (D) new types should be developed, such as a super-Blenheim with two Hercules engines, or a twin-engined Hurricane; (E) the possibilities of the shell-firing *canon* should be more fully explored. If these weapons are sound, and I see no reason why they should not be, then surely we lag behind other countries. ANTI-BOMBER.

Bristol.

"DAWN PATROLS"

Snag—in Brief

RATHER a "snag" the fact that the "defenders" have a register of the club machines used by the "attackers," don't you think? I do, anyway! It undoubtedly cost me a breakfast. STANLEY A. WAKEFIELD.

Worthing.

SUBSIDIES

Another Plea for Lower Flying Costs

I MAY be wrong, but it seems to me that "Indicator" in his comments on subsidisation (*Flight*, March 31, page 319) has missed the point, that is, if he had one in mind. He says that the barely "A" licence pilots are about as much use for war as a sick headache, and that the fellows with 50 hours flying, or more, per year should be helped on by the Government. In other words, if you can't afford at least £75 per year, plus club fees, etc., to pay for the said 50 hours' flying, you just stay out of an aeroplane!

This seems to me not only unfair but an extremely short-sighted policy if the Government want to build up a decent reserve of pilots in the event of war. At present we have a little over 8,000 pilots in the R.A.F. and the Volunteer Reserve. How many would be left after 12 months of a real, first-class war? The answer doesn't bear much thinking about. We ought to aim at 80,000 pilots in this country, not 8,000, and there are any number of men of suitable age and fitness, keen and anxious to learn to fly if the cost were not so prohibitive. I obtained my "A" licence on my fortnight's summer holiday last year at a South Coast aerodrome which, I believe, offered the cheapest instruction in the country. I have since been able to afford very little flying indeed, but am saving up the shekels now in order to be able to pay for 10 or 15 hours' flying when my holiday becomes due in the summer; and the cheapest at which I can get it at is £1 10s. per hour. What sort of subsidy is that? When all is said and done, private flying is still a luxury at £1 10s. per hour. Unfortunately I am just over the age limit or I should have joined the R.A.F. Volunteer Reserve long ago and received my training for nothing.

Having got that off my chest, I would like to ask "Indicator" to be a little more encouraging to the "barely 'A' licence pilots." After all they only get their "As" because they are enthusiastic would-be aviators.

London, N.W.6. JOHN D. PARKER.

["Indicator" comments: "Perhaps I did not make myself quite clear. I intended it to be understood that the fifty-hour pilots should be more usefully assisted both before and after the fifty-hour mark. In the meantime those who have already done (and paid for) fifty or a hundred hours are at least as worthy of a special grant as the three-hour 'A' licence pilots."]

The FLYING PENCIL

"Flight" Visits the German Dornier Works to Inspect the Slim Do.17 and Some Outstanding Flying Boats: Production Methods

By H. F. KING

LOVELIEST and most romantic of cradles of flying is Germany's Bodensee, known to the rest of the world as the Lake of Constance. Its beauty lies not only in its vistas of water and distant mountains, but in the quaintness of its lakeside towns, like Meersburg, where Germany's oldest *schloss* dominates the hillside vineyards and streets of fantastically coloured houses. The charm of its associations has not been marred by the coming of the airship and aeroplane. Friedrichshafen has seen the founding and development of the monumental Zeppelin and Dornier interests.

By the courtesy of the German Air Ministry and of Dornier Metallbauten G.m.b.H., it was my privilege to visit the three modern plants—Manzell, Allmansweiller and Löwental—on the outskirts of Friedrichshafen, and there to see the construction of such outstanding aircraft as the Dornier Do.17 high-speed bomber-fighter (the "Flying Pencil") and the Do.18 and 24 flying boats. Our hosts likewise extended privileges to my companion, Max Millar, whose sectioned drawings of aircraft are well known to readers of *Flight*.

Our guide and counsellor was Herr Diemer, one-time Dornier test pilot, and now the best-informed and most entertaining purveyor of aeronautical propaganda one can ever hope to meet. Incidentally, he is the incarnation, in appearance and by nature, of Sherlock Holmes. It is a sore trial restraining one's pen from flying off into accounts of Herr Diemer's early exploits—bombing raids in bizarre Friedrichshafen Giants (joint products of Zeppelin and Dornier) and a successful assault on the world's altitude record at the end of the war, when he climbed to over 30,000ft. with an unsupercharged engine; or recounting tales woven round objects in the Dornier exhibition (popularly, but somewhat erroneously, termed museum), wherein one may trace the development of Dornier metal construction since the early war days. But space demands adherence to things of the present.

At the Manzell works we were greeted by a gentleman with a Leica, who recorded our facial characteristics from front and side. His studies subsequently adorned our passes, which were demanded on every visit to any of the three works.

The Manzell plant is devoted to the reception, inspection, testing and storage of materials and detail parts; to the manufacture of major components; and to the final erection and testing of marine aircraft. Even rubber, oil and petrol are tested on reception before being passed to the central stores for distribution. I was particularly interested in the Zeiss-equipped section, where photomicrographs of the structure of metals are obtained, and by the sea-water corrosion tank. In this tank a sort of water wheel, each blade or paddle of which carries a sheet of metal, makes one revolution every two hours, the results of repeated immersion being studied first-hand. Apart from the usual mechanical testing machines, I was shown a modern X-ray apparatus for the detection of flaws in metals.

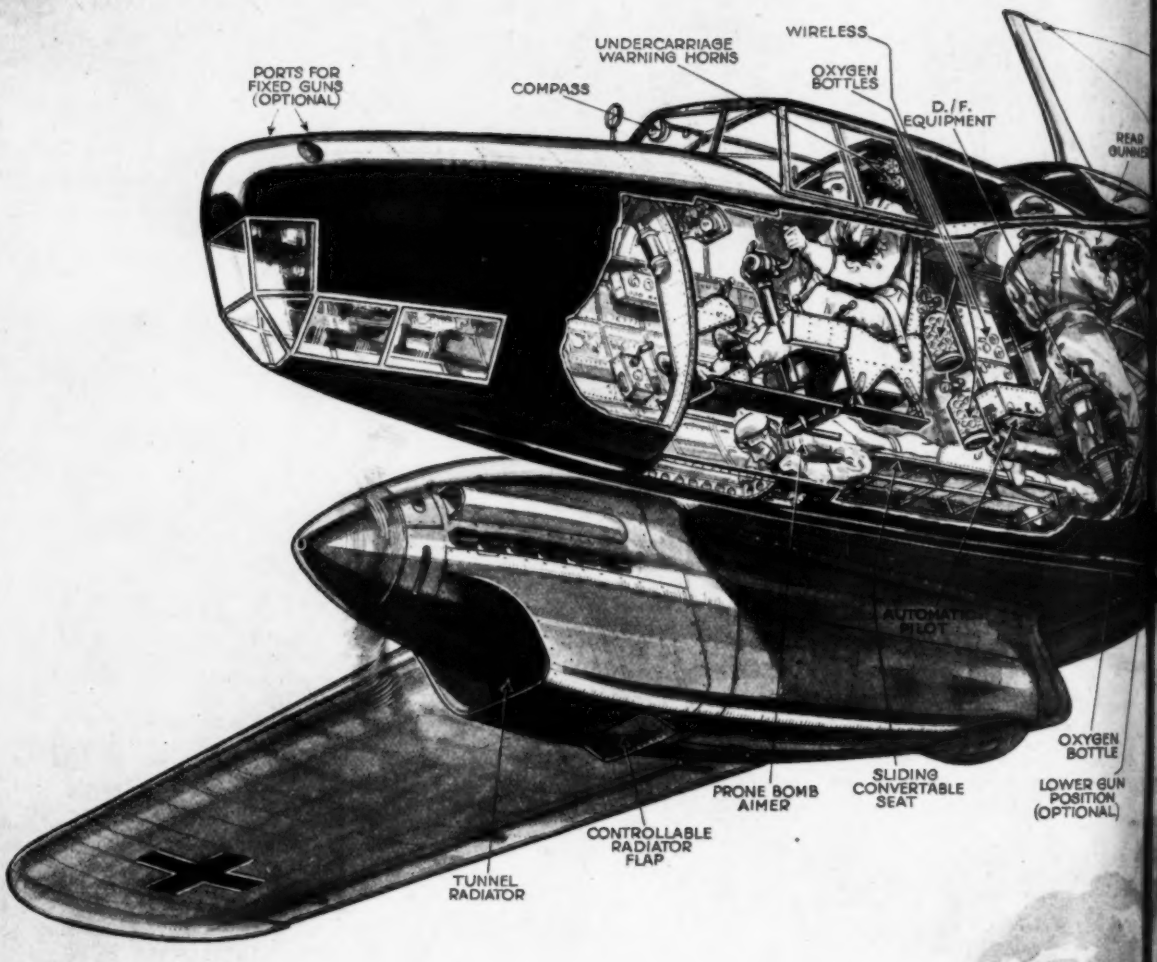
There is a special department for testing proprietary articles and small assemblies from sub-contractors. In the central stores (wherein—as, indeed, throughout the whole Dornier organisation—extensive use is made of colours to differentiate between various materials) the company sometimes holds a greater stock of a certain product than its manufacturers themselves.

In the shops I was immediately impressed by the completeness of the jigging. It was possible to detect portions of the Do.18 flying boat by the green markings, the Do.17 bomber landplane being allotted blue as its works colour. Such items as nacelles are built up on wooden jigs; the dexterity of operators on the wheeling machines, whereon fairing panels are formed, was well worth watching. Certain of the larger items are formed hydraulically.

A wind tunnel (115 m.p.h.) is main-

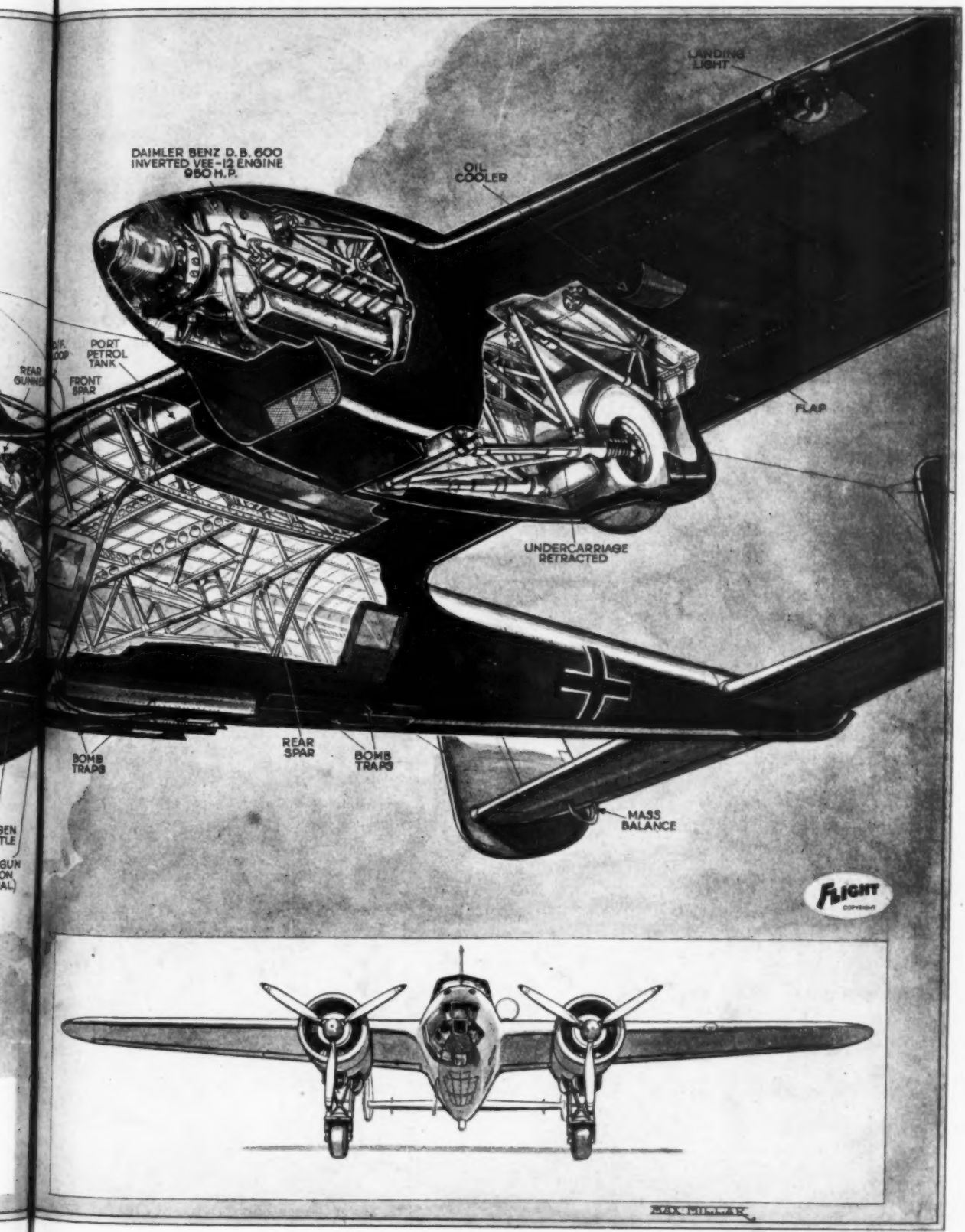
A Do.17 for Yugoslavia with Gnome Rhone 14No. engines. The cowlings are noteworthy.

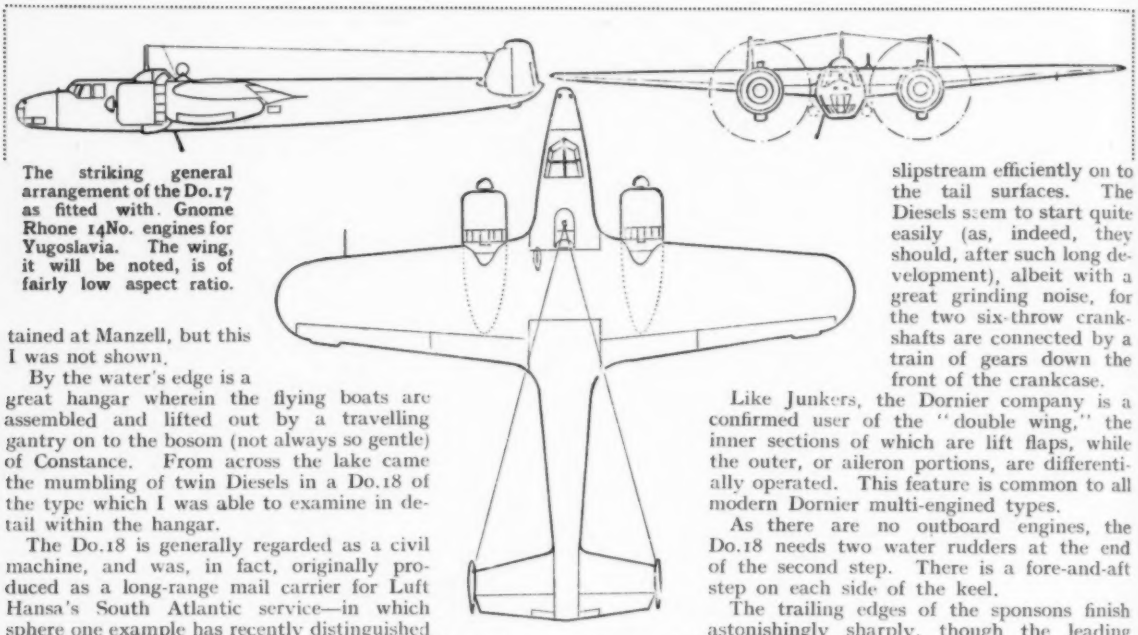
MODERN GERMAN PRACTICE: The DORNIER Do.17



This specially prepared *Flight* drawing presents at a glance the layout of the Do.17 bomber-fighter. Actually the machine represented here is to some extent a "cocktail" version, embodying various optional features such as twin fixed guns in the top front fuselage decking. If need be, bombs may be carried externally, low on the sides of the fuselage. The inverted Daimler-Benz engines may be regarded as opposite numbers of our Merlin, though current ratings are slightly lower than for the Rolls-Royces. On the right, Gnôme-engined version.

NIER Do.17 BOMBER-FIGHTER and its EQUIPMENT





The striking general arrangement of the Do.17 as fitted with Gnome Rhone 14No. engines for Yugoslavia. The wing, it will be noted, is of fairly low aspect ratio.

tained at Manzell, but this I was not shown.

By the water's edge is a great hangar wherein the flying boats are assembled and lifted out by a travelling gantry on to the bosom (not always so gentle) of Constance. From across the lake came the mumbling of twin Diesels in a Do.18 of the type which I was able to examine in detail within the hangar.

The Do.18 is generally regarded as a civil machine, and was, in fact, originally produced as a long-range mail carrier for Luft Hansa's South Atlantic service—in which sphere one example has recently distinguished itself by a 5,220-mile record. But the machines I saw belonged to a large order for the Luftwaffe (German Air Force), which has standardised on the type for long-range reconnaissance and bombing. Gun rings are fitted in the bow and aft of the wings, but turrets are not demanded by the comparatively low performance, the top speed with two 560 h.p. Jumo 205 Diesels being rather less than 160 m.p.h. Where the Do.18 does score, however, is on range; with the small wing panels, as fitted to the boats I saw, the figure is about 3,200 miles; larger wings, permitting an all-up weight of 24,200 lb., allow tankage for 400 miles more. For military service the boats will not normally have the assistance of a catapult, as do the Luft Hansa machines, but take-off is aided by three-bladed V.D.M. variable-pitch airscrews.

The general nature of the Do.18 is already known to readers, but there are several points worth emphasising. Spaced a surprising distance apart and mounted back to back, the two slab-sided Jumos have their thrust lines set at different angles. The front unit is horizontal, but its companion is tilted downward quite sharply at the rear, so that its propeller, driven through a long shaft mounted in a tunnel, is at an angle to the hull. This arrangement gives a good sweeping nacelle line, and, of course, directs the slipstream efficiently on to the tail surfaces. The Diesels seem to start quite easily (as, indeed, they should, after such long development), albeit with a great grinding noise, for the two six-throw crankshafts are connected by a train of gears down the front of the crankcase.

Like Junkers, the Dornier company is a confirmed user of the "double wing," the inner sections of which are lift flaps, while the outer, or aileron portions, are differentially operated. This feature is common to all modern Dornier multi-engined types.

As there are no outboard engines, the Do.18 needs two water rudders at the end of the second step. There is a fore-and-aft step on each side of the keel.

The trailing edges of the sponsons finish astonishingly sharply, though the leading edges and tips are well faired.

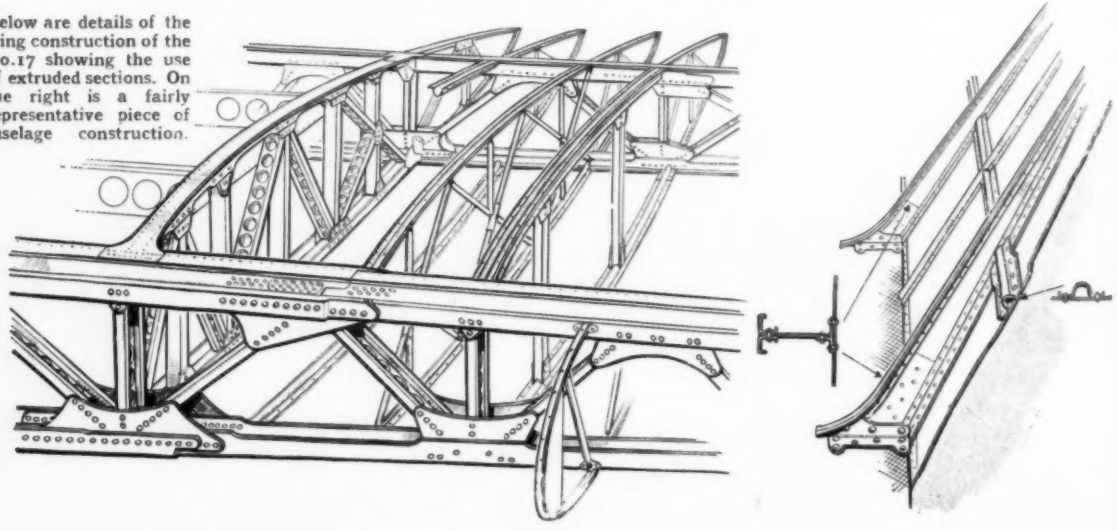
I was disappointed in not seeing a complete Do.24 boat as now being supplied to the Dutch Government, for this machine has exceeded all expectations—which expectations, as I learned in Holland some time back, were very high.

Unlike the Do.18, in which the wing is supported on a faired superstructure, housing, among other things, the radiators, the three-engined Do.24 has strut bracing beneath the central nacelle, though the structure of the wings and sponsons is generally similar. The hull, too, follows modern Dornier practice, but noticeable differences are the twin fins and rudders, tail gun position and cupolas (externally reminiscent of that on the Blenheim, though more angular) for each of the three gunners. Wright Cyclone G radials (850/1,000 h.p.) are specified for the Dutch boats, but I heard of a special version for the German Navy with different power plants.

In addition to the slotted flaps (which also serve as ailerons) on the outboard wing panels there is a split flap on the centre section.

A top speed of over 200 m.p.h. is attainable; other data are: all-up weight, 29,760 lb.; wing area, 1,162 sq. ft.; and range over 2,100 miles.

Below are details of the wing construction of the Do.17 showing the use of extruded sections. On the right is a fairly representative piece of fuselage construction.



Like the Do.18, the new boat carries its bombs externally, close in-board, on the outer wing panels.

I heard some glowing accounts of the behaviour of the Do.24 in rough-sea tests in the North Sea, where Dorniers do much of their experimental work. Operation from Lake Constance, of course, is relatively difficult, due to the altitude and the fresh water; conditions are virtually the same as those encountered in the tropics.

And while we are on flying boats, readers may be interested to learn that the colossal Do.X twelve-engined monoplane, built at Altenrhein, in Switzerland, is reposing, intact, in a Berlin museum, and that Italy's two Fiat-engined versions, so far as Herr Diemer knew, are still in service, though one has heard nothing of these monsters for years past.

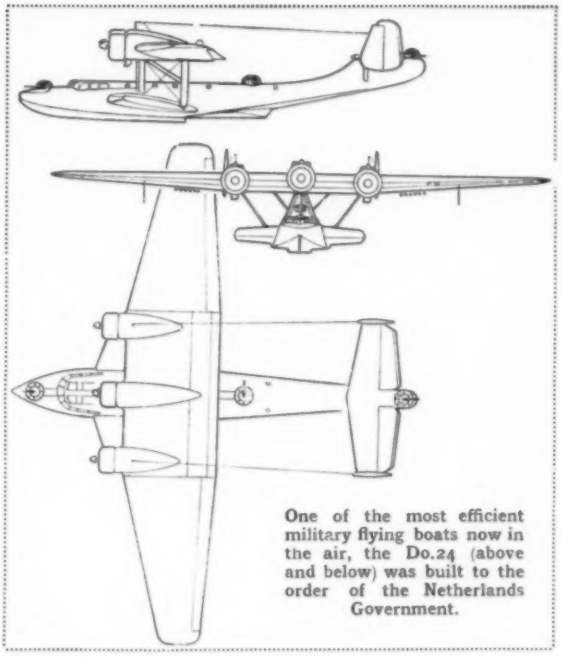
Backed by experience with such craft, Dorniers should be well placed for the production of big transatlantic machines. Actual developments in this connection are secret, but I am told that the projected boat represented at one or two aero shows by a model has been abandoned in favour of something much more up to date.

Though the primary object of my visit was to study the Do.17 bomber-fighter, I was able, at the Allmansweiller works (whither we were whisked by a works Mercedes, after partaking of Meersburg wine), to make a quick tour of a section devoted to the construction of Do.18s. At one stage in the proceedings each of the beautiful flush-riveted hulls is completely inverted on a special jig. In the same shop was a small series of Do.22 torpedo bombers for the export market. This type of parasol monoplane has a welded fuselage and a Hispano Series Y engine. The top speed is about 200 m.p.h. After assembly and the testing of the Jumos, the boats are dismantled and taken by lorry to Manzell for contractors' trials.

The Do.17

I was unable to see large-scale series production of the Do.17 for the Luftwaffe, as this was in progress at a number of distant factories, but I did see a fair-sized batch going through for Yugoslavia, and was subsequently shown one or two German machines which were at the adjacent Löwental aerodrome for tests.

The Do.17 is a very fast and manœuvrable monoplane rather in the category of our Blenheim, and there can be little to choose between the performance of the latest versions of the two types. Great latitude is allowed in the matter of armament and equipment to suit particular requirements. The Yugoslav machines, which were being assembled and tested under the supervision of a military mission, are powered with two Gnome-Rhône 14No fourteen-cylinder two-row radials, and, apart from provision for internal and external bomb stowage (the large bombs are carried on the sides of the fuselage), mounts two fixed belt-fed guns under the front cowling, a free gun in the



One of the most efficient military flying boats now in the air, the Do.24 (above and below) was built to the order of the Netherlands Government.

floor of the fuselage forward of the bomb compartments, and a fourth weapon on a shielded mounting above the wing. At the request of the chief of the Yugoslav mission I shall not describe the internal arrangements.

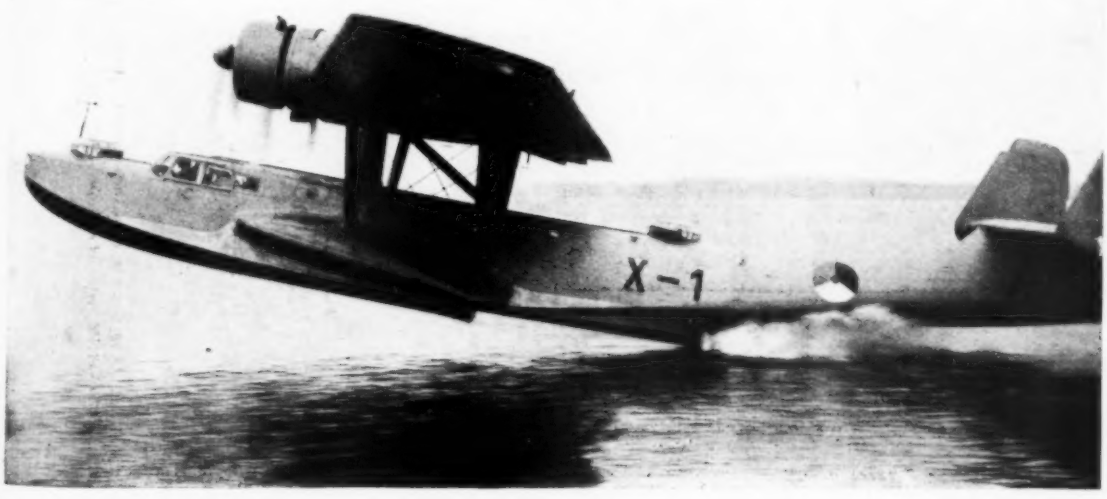
Before I left I was able to watch a Yugoslav Do.17 taking off at its gross weight. The run was protracted, and the actual "unstick" took place at a peculiar tail-down angle, but acceleration, when the undercarriage was raised, was of the rocket order.

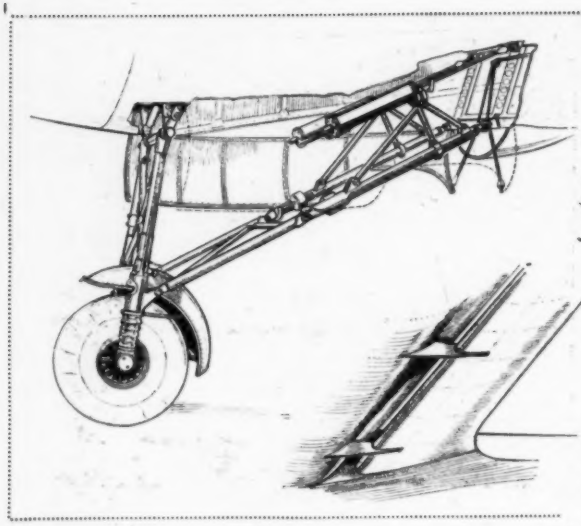
The Do.17 is commonly known as the "flying pencil" because of the slimness of the fuselage in side elevation. From below, however, the appearance is quite different, due to the peculiar shape of the central portion of the fuselage, the sides of which slope in sharply to a flat bottom. Viewed from the side it is one of the most business-like machines imaginable.

Data are: Span 59ft., length 55ft. 5in., wing area 592 sq. ft.

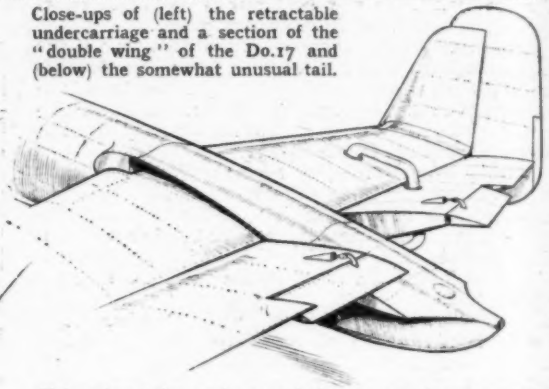
The cantilever wing of the Do.17 intersects the fuselage in such a manner as to be most aptly described as a shoulder wing. There are two spars, and the covering is part metal and part fabric. The taper is not heavy, and the tips are rounded.

Spar booms are special thick duralumin extrusions of





Close-ups of (left) the retractable undercarriage and a section of the "double wing" of the Do.17 and (below) the somewhat unusual tail.



unsymmetrical section with a projecting flange, the gauge of the metal being thinned at will throughout the length of each spar. There is thus a certain affinity between the Do.17 wing and that of the Do.X. The girder-type spar bracing is by lightened dural members of broad channel section; the ends of these are flanged inward and are anchored on substantial plates. Main ribs are built up of duralumin channel sections; intermediate ribs have tubular bracing. Fuel tanks are carried between the spars on the inboard sections.

Fabric covering extends between the spars on the lower surface of the wing, the remainder of the wing having smooth metal covering with flush riveting.

The trailing edge is of special formation to give a slotted effect to the flaps, which extend between the ailerons and fuselage; they have set-back hinges, and are operated mechanically. The slotted ailerons are of high-aspect ratio and incorporate trimming tabs.

Fuselage Construction

In section the slim fuselage starts off more or less oval, but quickly changes to a flat-bottomed structure which must be about twice as wide at the top as at the bottom, returning once more to elliptical and circular section as it nears the tail.

Built-up frames and intermediate stiffeners are employed in the fuselage construction, being notched to receive the channel-section stringers, the lips of which are flattened where required, at the intersection with a frame. The frames are most substantial, of course, in the vicinity of the wing.

At the forward end of the fuselage the covering is applied in large formed panels.

Trimming tabs and mass balances are incorporated in all the movable tail surfaces and the tailplane is (strangely enough, in such a fast machine) adjustable. This latter feature is probably necessitated by the marked change in fore-and-aft trim occasioned by the slotted flaps.

The twin fins (like the tailplane, metal-skinned) and aerodynamically balanced rudders are faired in at the extremities of the tailplane, which has holes to receive the mass-balance weights of the elevators.

Power Plants

Do.17s of the first series delivered to the Luftwaffe were fitted with two unsupercharged B.M.W. VI Prestone-cooled vee-twelves giving a maximum output of 750 h.p. apiece. The arrangement of the reduction gearing on these units results in an unfortunate cowling shape, the thrust line being well below the cylinder banks. With the Daimler-Benz (Mercedes) D.B.600 950 h.p. liquid-cooled inverted vees, as specified for later machines, performance and appearance are much improved. The radiator is mounted below the front portion of the crankcase. Three-bladed V.D.M. variable-pitch airscrews (as made in England by Constant Speed Airscrews, Ltd.) are fitted.

As already explained, the Yugoslav machines are powered with two-row Gnome-Rhône radials. These are fitted with N.A.C.A. cowlings of unusually long chord; "dishpan" crankcase cowlings and trailing-edge cooling flaps are features of this installation.

Whatever the power plant, the undercarriage of the Do.17 is always the same, each half retracting with a rearward motion into a nacelle and leaving a section of the wheel exposed. Retraction is effected hydraulically in the manner indicated in the accompanying drawings. The "clam shell" doors close and the tail wheel retracts during the final stage of the operation.

For normal bombing duties a crew of three is carried, being grouped in the forward part of the fuselage so that intercommunication is easy. In the extreme nose are transparent panels which give light for bomb sighting

(*Concluded on p.* 368.)

The Do.17 as powered with two Daimler-Benz D.B.600 inverted vee-twelves. This version is very fast indeed.

SERVICE AVIATION

Royal Air Force and Official Announcements: Fleet Air Arm News: Military Aviation Abroad

GUARDING THE GATEWAY: A Hawker Hart (Kestrel IB) over the Suez Canal. The unfamiliar device on top of the engine cowling, resembling a waffle iron, is an air filter, now standard equipment Out East.

Australia's Air Defence

IT is reported that the Royal Australian Air Force is planning the closest co-operation with the Royal Air Force at Singapore. There are to be combined air exercises to test the defence strategy of Australia's northern approaches.

Air Force List

THE April issue of the *Air Force List* has now been published. It can be purchased (price 4s.) from H.M. Stationery Office at the following addresses: Adastral House, Kingsway, London, W.C.2; 120, George Street, Edinburgh; 2, York Street, Manchester; 1, St. Andrew's Crescent, Cardiff; 15, Donegall Square, Belfast; or through any bookseller.

No. 1 Anti-Aircraft Co-operation Unit

HEADQUARTERS No. 1 Anti-Aircraft Co-operation Unit moved from the R.A.F. Station, Biggin Hill, to the R.A.F. Station, Farnborough, with effect from April 10, on which date the unit was transferred from No 11 (Fighter) Group to No. 22 (Army Co-operation) Group.

This unit tows targets for practice firing. For years past its headquarters have been at Biggin Hill. Its transfer to No. 22 (Army Co-operation) Group is a mere administrative convenience.

Reunion Dinners

A REUNION dinner of the R.N.A.S., East Africa, will be held at the Garrick Hotel, 3/5, Charing Cross Road, London, W.C.2, on Friday, April 29, at 7 p.m. Full particulars are obtainable from C. S. Thompson, 155A, Upper Thames Street, London, E.C.4. The late Commanding Officer, Air Marshal Sir F. W. Bowhill, K.C.B., C.M.G., D.S.O., will be present.

Admiral of the Fleet Sir Roger J. B. Keyes, Bart., G.C.B., K.C.V.O., C.M.G., D.S.O., M.P., will preside at the Zeebrugge-Ostend annual reunion dinner to be held at the May Fair Hotel, Berkeley Square, London, W.1, on Saturday, April 23. Any officer who has not received a notice is requested to communicate with Lieutenant J. C. Keith-Wright, D.S.C., 2, Crosby Square, London, E.C.3.

Donibristle

THE R.A.F. Station, Donibristle, has been transferred within the Coastal Command from No. 16 (Reconnaissance) Group to No. 17 (Training) Group, with effect from April 1.

"Armament Training Stations"

THE title "Armament Training Camp" has been changed to "Armament Training Station" with effect from April 1.

Gordon Shephard Memorial Prize

THE following are the prize-winners in the 1937 competition for the Gordon Shephard Memorial Prizes. The competition is open to all members of the Royal Air Force for essays on reconnaissance.

First Prize.—Flight Lieutenant W. F. Pharazyn, No. 72 (Fighter) Squadron, Church Fenton. Second Prize.—Wing Commander R. P. M. Witham, O.B.E., M.C., Royal Air Force Staff College, Andover. Third Prize.—Wing Commander C. S. N. Johnston, Headquarters, Bomber Command, Uxbridge.

The Memorial Essay Prizes were established by Sir Horatio Hall Shephard in memory of his son, the late Brigadier-General G. S. Shephard, D.S.O., M.C., R.A.F.

Flying Accidents

THE Air Ministry regrets to announce the following accidents:—Sergt. Matthew Henry Baxter lost his life in an accident which occurred near Rowlands Castle, Hampshire, on April 4, to a single-seater aircraft of No 43 (Fighter) Squadron, Tangmere, Sussex.

An accident occurred at Tibthorpe, near Driffield, on April 5, to an aircraft of No. 75 (Bomber) Squadron, Driffield, Yorkshire, in which the following occupants lost their lives:—Flt. Sergt. Edward James Merchant (pilot), Sergt. Ronald George Cowley Marshall, A/C.1 Ronald Herbert Fish, Crpl. Walter Greaves, and A/C. George Jeffrey Humphries.

An accident occurred off the mouth of the Humber on April 7 to an aircraft of No. 233 (G.R.) Squadron, Thornaby, Yorkshire, in which the following occupants are missing and believed to have lost their lives:—Flt. Lt. William Noel Hamilton Banks (pilot), P/O. Felix Oswald Thresher, and A/C.1 Robert Munro.

Royal Air Force Gazette

General Duties Branch

Flt. Lt. J. H. Hill is granted a permanent commission in that rank (April 1); Flt. Lt. A. J. Biggar is granted a permanent commission in that rank (April 1).

Flt. Lt. D. P. Lascelles is promoted to Squadron Leader with effect from April 1.

The following Flying Officers are promoted to the rank of Flight Lieutenant on the dates stated:—A. F. Bandidt, O. H. D. Blomfield, K. J. McKay (March 14); B. Robinson, C. F. Sarsby (March 22); E. U. G. Solbé (April 1); H. de C. A. Woodhouse (April 2).

F/O. (A/Flt. Lt.) A. Foord-Kelcey is promoted to the rank of Flight Lieutenant with effect from April 1, with seniority of January 1.

F/O. H. C. Bazeley (Lt., Royal Artillery) is granted the honorary rank of Flight Lieutenant (January 21).

The following Flying Officers are granted the acting rank of Flight Lieutenant on the dates stated:—W. F. Barton (February 23); J. W. Hathorn (March 1); P. J. Sanders (March 3); G. T. Gilbert (March 8); W. W. Loxton (March 14).

Flt. Lt. M. Watson is placed on the half-pay list, Scale B, from March 9 to March 12, inclusive; Flt. Lt. P. C. Lawrence is transferred to the Reserve, Class A (March 8); Flt. Lt. J. R. S. Agar is transferred to the Reserve, Class A (March 28).

The following Flight Lieutenants are transferred to the Reserve, Class A (April 1):—A. J. D. Harding, R. S. Howe, C. F. M. Rambaut.

Equipment Branch

Flt. Lt. H. J. Hunter is placed on the retired list at his own request (April 1).

Medical Branch

Wing Cdr. E. N. H. Gray, L.R.C.P. and S., D.P.H., is placed on the retired list at his own request (April 1).

Dental Branch

Flt. Lt. F. F. Kennedy, L.D.S., is granted a permanent commission in that rank (April 5).

SERVICE AVIATION (CONTINUED)

Royal Air Force Reserve

Reserve of Air Force Officers

General Duties Branch

Telegraphist-Lt. J. F. Shooter (R.N., Ret.) is granted a commission as Flight Lieutenant in Class C (May 10, 1937).

Flt. Lt. J. Ramsden is transferred from Class A to Class C (September 12, 1937); Sqn. Ldr. C. A. Rea, A.F.C., resigns his commission and is permitted to retain his rank (January 23).

Medical Branch

Flt. Lt. H. J. Melville, M.B., Ch.B., relinquishes his commission on appointment to a commission in the Royal Australian Air Force (July 27, 1937).

Auxiliary Air Force

General Duties Branch

No. 504 (COUNTY OF NOTTINGHAM) (B.) SQUADRON.—F/O. J. B. Parnall is promoted to the rank of Flight Lieutenant (March 14).

No. 602 (CITY OF GLASGOW) (B.) SQUADRON.—F/O. E. V. N. Bell is promoted to the rank of Flight Lieutenant (March 17).

No. 610 (COUNTY OF CHESTER) (B.) SQUADRON.—Brigadier-General Sir William Bromley-Davenport, K.C.B., C.M.G., C.B.E., D.S.O., T.D., is appointed Honorary Air Commodore (April 5).

Equipment Branch

Sqn. Ldr. V. J. B. Jacobs (R.A.F. Ret.) relinquishes his commission on cessation of duty (December 29, 1937).

Auxiliary Air Force Reserve of Officers

General Duties Branch

The following Flight Lieutenants are transferred from Class A to Class C on the dates stated:—J. Cherry (February 21); T. L. E. B. Guinness (March 31).

Royal Air Force Appointments

General Duties Branch

Air Vice-Marshal.—D. C. S. Evill, D.S.C., A.F.C., to H.Q., Bomber Command, Uxbridge; on appointment as Air Officer in Charge of Administration, 28.3.38.

Group Captain.—C. W. Mackey, to H.Q., No. 6 (Auxiliary) Group, London; for duty as Senior Air Staff Officer, 21.3.38.

Wing Commanders.—W. E. Theak, to No. 7 (B.) Sqn., Finningley; to command, 5.2.38. G. W. Bentley, to No. 202 (G.R.) Sqn., Kalafrana, Malta; to command, 19.3.38.

Squadron Leader.—C. Snow, to No. 9 F.T.S., Hullavington; for Engineer duties, 20.3.38.

Flight Lieutenants.—C. H. Smith, to Special Duty List; employed with the Indian Air Force, 26.2.38. R. Faville, to R.A.F. Station, Thorney Island, 19.3.38. M. A. Aylmer, to No. 1 F.T.S., Leuchars, 19.3.38. M. D. C. Biggie, J. B. Sims, to No. 2 F.T.S., Brize Norton, 19.3.38. D. P. Hanafin, to No. 3 F.T.S., South Cerney, 19.3.38. P. I. Harris, to No. 6 F.T.S., Netheravon, 19.3.38. F. Rump, to No. 7 F.T.S., Peterborough, 19.3.38. L. W. Burgess, to No. 8 F.T.S., Montrose, 19.3.38. J. F. Hobler, W. A. Richardson, to No. 9 F.T.S., Hullavington, 19.3.38. F. D. Nugent, to No. 10 F.T.S., Tern Hill, 19.3.38. G. T. Toland, to No. 11 F.T.S., Wittering, 19.3.38. C. R. J. Pink, M. D. Thunder, to R.A.F. College, Cranwell, 19.3.38.

Equipment Branch

Squadron Leader.—H. E. Young, to R.A.F. Depot, Middle East, Aboukir, Egypt; for Equipment duties, 5.3.38.

Flight Lieutenant.—M. M. McMullan, to R.A.F. Depot, Middle East, Aboukir, Egypt, 3.3.38.

Medical Branch

Flight Lieutenant.—D. F. Cameron, to R.A.F. General Hospital, Dhibban, Iraq, 28.2.38.

Owing to the greatly increased length of these lists as a result of R.A.F. expansion, ranks are confined to those of Flight Lieutenant and above.

FOREIGN SERVICE NEWS

Two-seater Fighter—1,880 h.p.

CURVALE, the French test pilot, has made the first flights with the Marcel Bloch 170—a two-seater fighter with a pair of Gnome Rhone 14 No radials giving a combined output at altitude of 1,880 h.p. In the first place this machine was intended for two Hispano Suiza 14AA engines (2,240 h.p. total), but production difficulties seem to have intervened. Data for the Gnome-powered model are wing area 366 sq. ft and all-up weight 13,200lb.

The introduction of this machine may mean that the two-seater fighters with the small-diameter Gnome-Rhones or Hispanos of about 700 h.p. each, are not powerful enough to meet modern demands.

Shell-guns for Patrol Bombers

LARGE-BORE automatic shell-guns, capable of firing 200 rounds a minute will, according to a current rumour, be included in the armament of fifty-four four-engined patrol-bomber flying boats on order for the U.S Navy from the Sikorsky and Consolidated concerns. Presumably these weapons will be products of the American Armament Corporation, which for some time has been experimenting with 37 mm. guns. The forward armament of the Bell Airacuda twin-engined multi-seater fighter will eventually be composed of two small-bore shell-guns by these manufacturers, though one gathers that at present only mock-ups are installed.

The fitting of large-bore guns to flying boats is by no means as novel as may generally be supposed. Several years ago the Blackburn Perths in service with the R.A.F. carried a 37 Vickers-Armstrong gun in the bows and we may look for the revival of shell-guns in future Service boats.

Future Soviet Construction

A CONTINENTAL report has it that when Soviet factories have finished turning out American-designed Vultee V-11 attack-bombers (in the same class as the Battle, but with inferior performance) they will build under licence Potez 63 bomber-fighters (no faster than a Blenheim and carrying less load), Hanriot 220 twin-engined two-seater fighters (the French prototype is by no means through its tests), the Boeing YB-17 heavy bomber and a twin-engined Curtiss bomber, presumably similar to the A-18 attack machine. The Consolidated twin-engine monoplane flying boat may also be built.

French Production

AN indication of the state of French military aeronautics in recent times is given by the case of the Morane 405 single-seater fighter which was completed over two years ago when it was, in the words of a French correspondent, a very decent aeroplane. Lately the first prototype machine was crashed at Villacoublay by a Lithuanian officer; the second prototype (No. 02, according to the French system of designating military types) is still not in commission and the first production machine is only now doing its tests.

A report that of 160 machines ordered by the French Navy for 1937 only four had been delivered was denied by the Air Minister, who claimed that 87 had been delivered. Our contemporary *Les Ailes* declares that they belonged to a former list of orders.

At the moment a number of prototypes are still awaiting their engines. Production of both air- and liquid-cooled power plants is still sadly behindhand.

THE FLYING PENCIL

(Concluded from page 366)

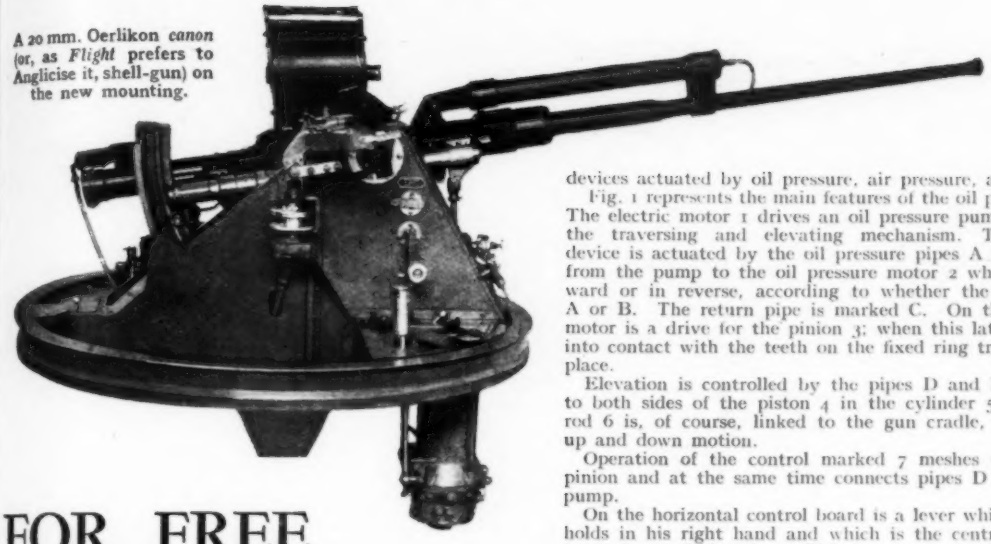
and improve the pilot's vision. The pilot's seat is offset to port, which should permit changing pilots in flight, and the control column is of the "horned" type. Internal equipment includes an automatic pilot, two-way wireless and D/F equipment. The top gun position corresponds roughly with the leading edge of the wing. As broadside fire is not intended the gun mounting is not power-operated, but is well protected. The particular B.M.W.-engined machine I inspected had only one gun though, as previously mentioned, a variety of armament installations is possible.

Bombs are carried horizontally in the bottom of the fuselage behind the plane of the front spar, the wheel for opening the traps being in the fore-part of the fuselage where it is accessible to the pilot and the bomb aimer.

Dive bombing should be possible when bombs are carried on the external racks which may be fitted. Certainly the strength of the machine is sufficient. I was told that pilots sometimes dive a Do.17 up to about 300 m.p.h., pull out, zoom for some thousands of feet, and finish up with a loop.

The behaviour of the machine at the stall is claimed to be unusually good, there being no tendency to drop a wing. Regarding performance, I can only recall that a Yugoslav Do.17 flew from Friedrichshafen to Belgrade at an average speed of 268 m.p.h.

Altogether the Do.17 seems to be a highly formidable weapon and I am grateful for being allowed to study it.



A 20 mm. Oerlikon *canon* (or, as *Flight* prefers to Anglicise it, shell-gun) on the new mounting.

FOR FREE SHELL-GUNS

An Oerlikon Aircraft Mounting with Electrical Drive

THE difficulties occasioned by the mounting of fixed shell-guns on aircraft are rather overshadowed at the moment by problems associated with "free," or movable, installations. Various armament concerns have been wrestling with these problems, and details of a mounting developed by Werkzeugmaschinenfabrik Oerlikon, Zurich-Oerlikon, Switzerland, for the FFS model of 20 mm. gun have lately been released.

Essentially, the mounting comprises a fixed ring, mounted on or in the aircraft structure, on which revolves a second ring,

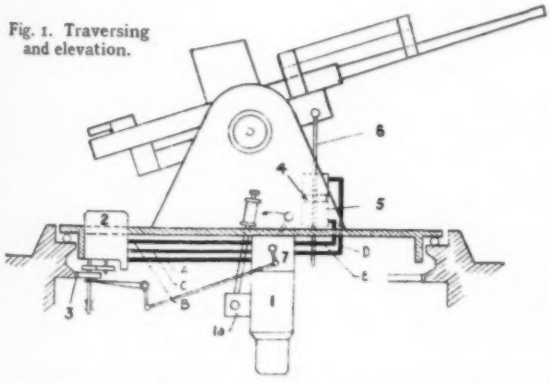


Fig. 1. Traversing and elevation.

supported by ball bearings. The revolving ring has two vertical walls which carry the gun cradle. Also associated with the revolving ring are the gunner's control board and his seat. A pinion, hydraulically driven, revolves the ring; the elevating gear is essentially a piston and hydraulic cylinder. The entire traversing mechanism works on the revolving ring and comprises devices actuated by oil pressure, air pressure, and electricity.

Fig. 1 represents the main features of the oil pressure device. The electric motor 1 drives an oil pressure pump which feeds the traversing and elevating mechanism. The traversing device is actuated by the oil pressure pipes A and B leading from the pump to the oil pressure motor 2 which works forward or in reverse, according to whether the oil enters by A or B. The return pipe is marked C. On the axle of the motor is a drive for the pinion 3; when this latter is brought into contact with the teeth on the fixed ring traversing takes place.

Elevation is controlled by the pipes D and E, which lead to both sides of the piston 4 in the cylinder 5. The piston rod 6 is, of course, linked to the gun cradle, providing the up and down motion.

Operation of the control marked 7 meshes the traversing pinion and at the same time connects pipes D and E to the pump.

On the horizontal control board is a lever which the gunner holds in his right hand and which is the central control for traversing and elevating. This lever controls the oil pressure

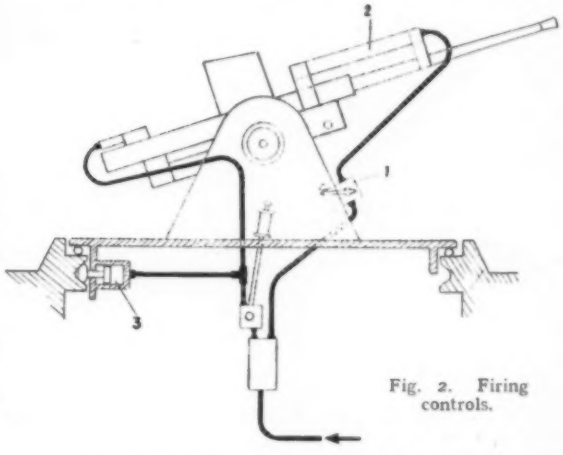


Fig. 2. Firing controls.

pump through the intermediate gear marked 1a on Fig. 1; movement to the left or right revolves the ring in the appropriate direction, while easing it forward or backward lowers or raises the muzzle.

The compressed air device for cocking and firing is shown in Fig. 2. This has a three-fold purpose; if the gunner opens the valve 1 compressed air fills the cylinder 2, the piston of which cocks the recoil spring of the gun; if he presses with his thumb on the button on the main control lever, compressed air operates the trigger, and at the same time the blocking mechanism marked 3 comes into operation, so that any movement of the ring is arrested during firing. The cradle is also locked.

The electric motor (24 volts) is started by an auxiliary lever on the main control handle, so that the gunner's fist grips it automatically. In critical moments a special button can be pressed which, causing the motor to revolve faster, accelerates the traversing and elevating movements.

Data on the mounting (which, of course, is intended to have a turret top) are: Elevation range, −10 to +90 degrees; traversing range, 360 degrees; weight of turret without gun, 1.87 cwt.; electric current consumption at 24 volts, 15 to 20 amps; maximum speed of traverse, 36 degrees a second; maximum speed of elevation, 25 degrees a second.

A BOOK ON ELEKTRON

"ELEKTRON," a finely produced and illustrated text book, has been compiled by the producers, suppliers and manufacturers of Elektron magnesium alloys.

Extensive data on the composition and properties of each alloy are contained in the book, and chapters deal with the origin, development and actual applications. The frontispiece is a photograph of the D.H. Albatross, in which Elektron is used extensively. The price of the book, which may be obtained from the producers of the alloys, is 10s. 6d.

Elektron alloys are in the hands of seven firms: Magnesium Elektron, Ltd., of Clifton Junction, Manchester, are sole producers; F. A. Hughes and Co., Ltd., are suppliers; and Sterling Metals, Ltd., Coventry; J. Stone and Co., Ltd., of Deptford, London; and the Birmingham firms, James Booth and Co., Ltd; Birmingham Aluminium Casting Co., Ltd.; and Birmetals, Ltd., are licensed manufacturers.

COMMERCIAL AVIATION

NOT RIVALS YET: The Short *Circe* taxying past the new liner *Capetown Castle*, which will shortly make her maiden voyage. Five days against fourteen tothe Cape!

THE WEEK AT CROYDON

—And in the Air Transport World: "A. Viator's" News and Comments

AER LINGUS TEORANTA, the Irish Sea Airways, supported by the Government of Eire and sanctioned by the British Government, is the last company with which I should try bullying and oppressive methods if I were a railroad king. I should be the less inclined to do so with Mr. Sean O' h'Uadhaigh as chairman, for I imagine he would be a broth of a bhoy in a bicker.

Anyway, the much-discussed booking ban of the railway companies is still enforced on the Irish company, and unless it is taken off shortly, I imagine there will be wigs on the green. As a matter of fact, every company so far that has presented a fierce front to the rail despots in this matter, preferably through an influential and titled spokesman, has had much the same success that might be expected from standing up firmly to any dictator.

Flight has been attacking this booking ban (which, as the chairman of Aer Lingus Teoranta pointed out recently, prevents rail-ticket agents from booking tickets, displaying publicity matter or distributing timetables for the banned air company) for a long time, and now I see that the rail interests are writing to *The Times* moaning that counter measures against this oppression are unfair and not cricket.

As a matter of fact, the whole business actually became such a crying scandal that Lord Swinton had to speak severely to the sponsors of the booking ban and Members of Parliament decided to block private railway Bills in the House until the matter was put right.

Décor

Considerable interest has been displayed at Croydon in the tasteful scheme of redecoration at the Air France office in the Main Hall. The background is a map of the world, the countries being of dark wood against a biscuit-coloured background. Air France routes are displayed in chromium lines with red circles at stopping places and the whole affair gives a very pleasant effect.

Since K.L.M. started the idea of definite schemes of decoration, instead of a mass of ill-assorted posters, all the big air companies have followed suit.

Both the Oxford and the Cambridge boat race crews left Croydon by air last week, and there were other notable travellers, including Popeye the Sailor—a life-size rubber model.

About 100 Rhesus monkeys came in by International Air Freight from Holland; and the mongoose from the Isle of Man, which was alleged to talk and created some stir in the newspapers a while back, went out by Imperial Airways to Paris.

Irish Sea Airways brought a party of twenty in from Dublin, and amongst them was the Lord Mayor of that city. A facility on the Dublin line which enjoys considerable popularity is the reduced-fare seven-day return. This is a route which the travelling public needs and appreciates. Another air line of considerable value to travellers is that of Olley Air Service from Penzance to the Scilly Isles, where the only alternative is a three-days-a-week boat which many people dread to use on account of the roughness of the sea.

Benevolent railway kings who write letters to the papers about their unflagging zeal for the public weal and their kindly interest in the progress of civil aviation, still rigidly enforce the booking ban on both these useful air routes.

K.L.M. Plans

K.L.M. pilots say that the new Lockheed 14 Super Electra comes up to their highest expectations, and that in practice it cruises somewhere between 225 and 250 m.p.h.

Six of these aeroplanes are in process of being delivered to the Dutch company, three for the West Indies routes and three for Europe. One is to be used, I understand, on the Liverpool-Manchester-Doncaster-Amsterdam route, where its speed will enable many long-distance connections at Amsterdam to be made. Manchester's new and up-to-date airport at Ringway will be opened officially on June 25, and the K.L.M. service will start on June 27.

Certain connections will be made at Doncaster with North-Eastern Airways, to which end an optional landing at Doncaster has been scheduled by K.L.M.

North-Eastern Airways will link Glasgow with London this summer, as well as Edinburgh. Newcastle will be a junction at which the Glasgow and Edinburgh planes will meet, and loads will then continue to London in one machine.

Passengers leaving London at 4 p.m. reach Edinburgh at 7.25 p.m. Leaving Edinburgh at 9.5 a.m. passengers can be in Croydon at 12.30 p.m. Glasgow passengers, leaving there at 8.45 a.m., reach Croydon at 12.30 p.m., and when departing from Croydon at 4 p.m. they reach Glasgow at 7.45 p.m.

Strange jobs sometimes offer themselves to air line pilots. Not long ago a sufferer from leprosy arrived in Liverpool in a Greek boat. He was not allowed to land, of course, and Capt. E. R. Midgeley, of Olley Air Service, had the task of conveying him by air to Athens, accompanied by a doctor. No sooner had the machine arrived at Athens than an urgent message was received to say

(Continued near foot of next page.)

COMMERCIAL AVIATION (CONTINUED)

Ringway in June

BY the end of May it is hoped that the control tower, restaurant, general offices and hangars at Manchester's new Ringway airport will be ready. Concrete runways have now been laid down and the landing ground has been drained and levelled. Fifty acres of extra land are to be taken in, and the work here involves the removal of something like 600 trees.

South American Extension

PAN-AMERICAN Airways have recently started a new weekly service between Rio de Janeiro and Buenos Aires, via Asunción. So far only mail has been carried, but the Douglas D.C.3s, which are being used throughout, should be carrying passengers this month. The service from the tourist's point of view is interesting in that the machines pass over the famous Yguazu Falls where there is now a landing ground, though whether the D.C.3s can land there or not is a matter for conjecture.

Glasgow Direct

BETWEEN May 2 and May 21, Railway Air Services will be operating a direct service between London and Glasgow in connection with the Exhibition, though presumably, if the traffic appears to warrant such a course, this service may eventually be run on an all-the-year-round basis. A machine will leave London at 9.30 and fly to Liverpool, with "on demand" stops at Birmingham and Stoke, and passengers will then fly through to Glasgow. Needless to say, this service does not affect the normal one, which is flown via Belfast and, in fact, the machine which is used between London and Liverpool will be that flying on the normal Belfast run. This service will be run twice daily in each direction after May 23.

During last season the standard of regularity put up by R.A.S. pilots on the London-Belfast-Glasgow run was an extraordinarily high one. Between April and November the efficiency was actually 100 per cent., and during the whole year it was as high as 99.7 per cent.

North-Eastern Inauguration

TO mark the introduction of their Newcastle-Glasgow connection on their main service from London, the directors of North-Eastern Airways conveyed the representatives of five Glasgow newspapers to Croydon last Friday. In view of the world exhibition—at the moment the sole topic of Glasgow conversation—which is now nearing completion, it was a timely demonstration of the value of air travel.

Lord Grimthorpe, chairman of North-Eastern Airways, welcomed the guests to luncheon at Croydon. Mr. F. C. R. Jaques, managing director, said that the company had achieved 97 per cent. operational regularity last year. Mr. F. W. Jones spoke with real feeling on the national aspect of internal airlines and our duty to posterity and British prestige abroad. Several guests said a few words of appreciation and seemed to have enjoyed their trip to Croydon and their darts match at Doncaster.

North-Easterns have been handicapped since their inception by the inadequacy of aerodrome facilities in Scotland. At Renfrew the aerodrome is suitable for day operation and is wireless equipped; Macmerry, Edinburgh, however, is a fine-weather field only. Negotiations have been started with the Post Office for mail contracts, and the Maybury Committee suggested that a night mail service between the capital cities of Scotland would be a useful one.

The Solent Ferry

ALTHOUGH the P.S.I.W.A. summer time-table does not come into operation until May 23, some 1,700 passages have already been booked in advance on this company's services, and it would seem that record traffic figures are to be expected.

The company, incidentally, has recently obtained seven Army Co-operation contracts, and expects to put in some 700 hours' flying in South of England areas. Airspeed Couriers will, for the most part, be used for daytime work, while specially equipped Monospars will be used at night. Since Portsmouth Airport has no floodlighting, the night flying will be carried out from Southampton Airport.

Irish Sea Crossings

IN *Notice to Airmen No.* 40 of this year emphasis is laid on the need for a visual reporting procedure by the pilots of radio-less machines crossing the Irish Sea via the Isle of Man. They are advised to circle over Ronaldsway Airport, provided that this is possible in the prevailing weather conditions, and to cross the sea between aerodromes where radio, teleprinter or telephone facilities exist, so that the necessary information about the machine (and about the time at which it was expected to cross Ronaldsway) may be duly passed on. Needless to say, the Ronaldsway circuits should be made at a sufficiently low altitude for registration letters to be read.

In Ceylon

IT appears that Ratmalana aerodrome, Colombo, is not only to be enlarged, but also that the adjoining land is to be duly dealt with in order to provide a flying-boat basin. The Colombo-Kalutara canal now runs along the east side of the aerodrome and low-lying ground adjoins it; ultimately this ground is to be acquired and excavated. The present aerodrome runways are to be extended and 280 acres of land north of the aerodrome are to be taken in; when this is ready the hangar now situated on the northern boundary will be shifted.

Ratmalana was officially opened by Sir Andrew Caldecott, the Governor of Ceylon, when the all-mail-by-air-scheme was started by Tatas to connect with Imperial Airways at Karachi. Incidentally, it is proposed that the Director of Public Works in Ceylon should be appointed Director of Civil Aviation and the acting D.P.W., Mr. W. J. Price, will hold the dual post for the present. The Aero Club of Ceylon is to receive a grant for the purchase of an aeroplane and a subsidy of Rs.24,000 a year on the understanding that the club should become a limited liability company with Ceylonese management.

THE WEEK AT CROYDON

(Concluded from previous page)

that the doctor was needed immediately in Liverpool.

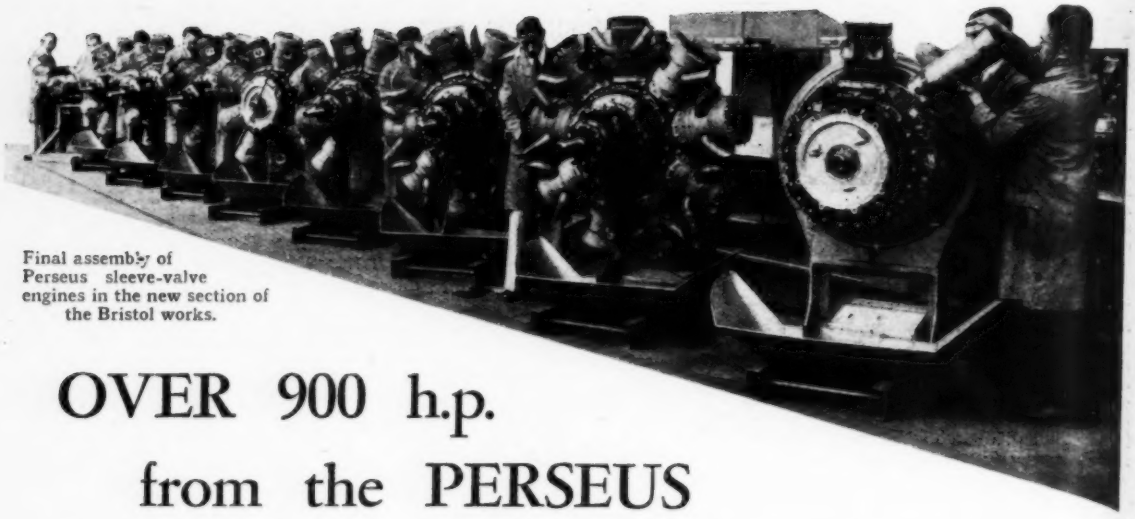
Midgeley set off back and did the trip in the record time of 12¼ hours' flying, or 16½ hours actual time, landing to refuel at Brindisi.

Somebody at somebody's annual dinner suggested that the first and most important way to peace was the universal abolition of aircraft, both military and civil. Another good idea is the suppression of all sea-going vessels and all big guns. A useful auxiliary method of getting a little peace is to abolish silly after-dinner speeches.

Forthcoming Events

April 21. R.Ae.S. Lecture*: "High Altitude Flying," by Prof. A. E. Younger.
April 28. R.Ae.S. Lecture*: "Factors Controlling the Development of Electrical Ignition on Aero Engines," by Dr. G. E. Bairsto.
April 30. Aero Golfing Society: R.A.F. Match, Felixstowe.
May 14-22. Finnish Aero Show, Helsinki.
May 17. Air League of the British Empire: Annual Dinner, Grosvenor House, London.
May 17. Aero Golfing Society: "Flight" Trophy, Royal Ashdown Forest.
May 28. Air League of the British Empire: Empire Air Day.
June 11. Bristol and Wessex Aeroplane Club: Garden Party.
June 18 and 19. Brooklands Four-club "At Home."
June 25. Official opening of Wolverhampton Airport.
June 30. Aero Golfing Society: Jubilee Cup, Prince's Sandwich.
July 2. R.Ae.C.: King's Cup Race.
July 16-18. Deauville Rally.
July 16. Official opening of Luton Municipal Aerodrome by Secretary of State for Air.
July 30. Official opening of Exeter Airport.
September 3-4. Cinque Ports Flying Club: International Rally, Lympne.

* All these lectures take place at the Institution of Mechanical Engineers, Storey's Gate, St. James's Park, London, S.W.1, beginning at 6.30 p.m.



Final assembly of Perseus sleeve-valve engines in the new section of the Bristol works.

OVER 900 h.p. from the PERSEUS

Excellent Figures for New Bristol Sleeve-valve Unit : Detail Improvements

A NEW engine in the Bristol sleeve-valve series—the Perseus XII—has recently passed the 100-hours' Air Ministry type-test and is in large-scale quantity production.

The Perseus XII is a moderately supercharged nine-cylinder radial of 52in. diameter developing a maximum power of 905 h.p. at 6,000ft., which must be regarded as exceptionally good for an engine of this size. Take-off output is 795/830 h.p. and the international rating 715/745 h.p. at 6,500ft.

Detail Improvements

In comparison with previous Perseus types several detail improvements have been made. One particularly interesting feature which has received official approval as a result of the type-test is the new Bristol accessory gear box which permits a large number of engine-driven accessories to be mounted on the bulkhead instead of on the engine itself. This simplifies installation and represents a valuable contribution towards the development of standardised interchangeable power units—a policy long advocated by the Bristol Company. Several alternative arrangements of the accessories can be provided and the enclosed flexibly jointed shaft for the gear box is available in various lengths.

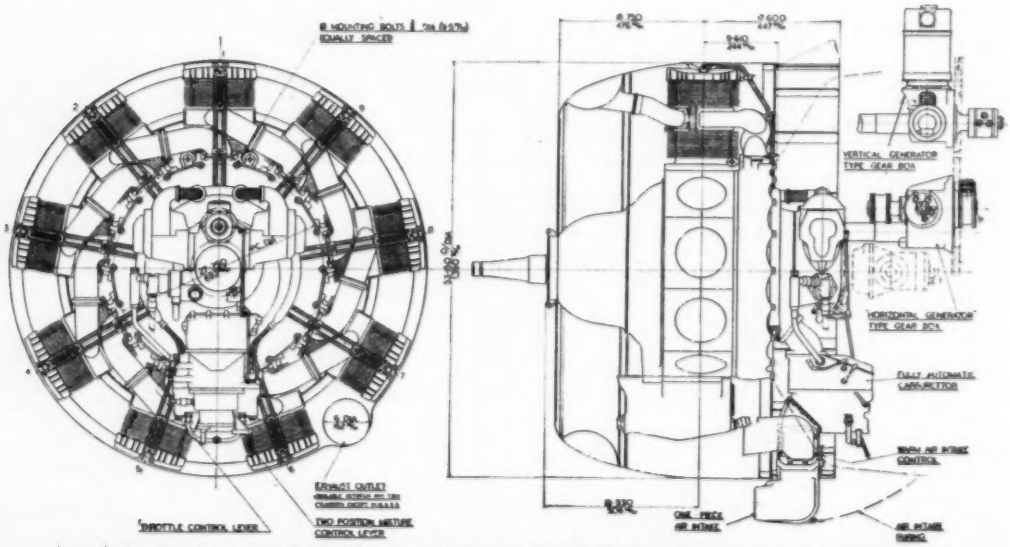
Another improvement is in the magneto timing control; a variable timing device is interconnected with the throttle in such a way that the best ignition setting is obtained for every throttle position. As on all current Bristol engines, the ignition system is shielded for radio screening.

One of the latest types of Claudel-Hobson fully automatic carburettors is specified, being provided with a controllable hot and cold air intake of improved design. The chute for collecting cold air is integral with the main body of the intake and projects downwards behind the rear cowl support ring. Its rear face is tapped for the attachment of suitable fairing. Two hot-air collectors are mounted one on each side of the intake body, projecting forward toward the two lower cylinders, and two spring-loaded shutters, operated by a single control lever, regulate the proportion of hot air admitted to the intake.

The Perseus XII is approved for use with a variable-pitch airscrew, a 13ft. De Havilland model having been fitted during 40 hours of the type-test.

Over 200 hours of hard flying have already been completed in the air.

The new engine is scheduled as the standard equipment of several new Service aircraft, presumably including the Westland Lysander army co-operation machine. The civil-rated version which will be announced shortly will be associated with some interesting developments in civil aviation. This engine is likely to be used in the new De Havilland high-wing twin-engined transport.


VERTICAL GENERATOR TYPE GEAR BOX
HORIZONTAL GENERATOR TYPE GEAR BOX
FULLY AUTOMATIC CARBURETTOR
THROTTLE CONTROL LEVER
TWO POSITION MAGNETO CONTROL LEVER

Installation drawings—the first published—of the new Perseus, showing the gear box for auxiliary drives.

HERE and THERE

News of the Week

Empire Air Day Plans

THIS year, with the Royal Air Force Display discontinued, Empire Air Day gains greatly in importance. Saturday, May 28, is the date, and fifty-eight R.A.F. stations will be opened to the public. Thirty-one civil aerodromes, to date, are also announced as taking part.

Circuses of Service machines travelling round several aerodromes during the course of the afternoon, and giving displays at each, will be a new feature this year.

The following R.A.F. stations, according to the Air League, will be open:—

Abbotsinch, Abingdon, Aldergrove, Andover, Biggin Hill, Calshot, Cardington, Castle Bromwich, Catfoss, Catterick, Church Fenton, Cranfield, Cranwell, Debden, Duxford, Eastchurch, Evanton, Farnborough, Felixstowe, Filton, Gosport, Halton, Hendon, Henlow, Hornchurch, Hucknall, Hullavington, Kenley, Leuchars, Lympne, Manston, Marham, Martlesham Heath, Mildenhall, Montrose, Mount Batten, North Coates, Northolt, North Weald, Odiham, Old Sarum, Pembroke Dock, Penhros, Peterborough, Sealand, South Cerney, Stratisliall, Sutton Bridge, Tangmere, Terne Hill, Thornaby, Turnhouse, Upper Heyford, Usworth, Waddington, West Freugh, Woodsford, Wyton.

The civil aerodromes, which include a number of "Reserve schools," are as follows:—

England.—Ansty, Brooklands, Bournemouth, Carlisle, Castle Bromwich, Desford, Doncaster, Eastbourne, Exeter, Filton, Gatwick, Gravesend, Hanworth, Heston, Hatfield, Hamble, Hull, Leamington, Meir, Shoreham, Speke, Stanley Park, Southend, Sywell, Woodley, Yeadon.
Scotland.—Dyce, Perth, Prestwick (May 21 instead of May 28).
Wales.—Cardiff.
Channel Islands. Jersey (May 26 instead of May 28).

Reserve School Expansion

AIRPORTS, LTD., announce that the Air Ministry has decided to increase the complement and capacity of the R.A.F.V.R. schools at Gatwick and Gravesend. Five additional aircraft and one extra full-time instructor have been allotted to each school.

The Air League Dinner

WHILE the annual dinner of the Air League, to be held at Grosvenor House, London, on Tuesday, May 17, is primarily an Air League function, all who wish to do so may attend. Tickets are 15s. 6d., exclusive of wines, and full details are available from the committee at Maxwell House, Arundel Street, London, W.C.2. It is hoped that distinguished representatives of all branches of British Aviation will be present as guests.

Aircraft Engineers at Southampton

THE Aircraft Engineers' Association is to hold a meeting at 7.30 p.m. on Monday, April 25, at the Star Hotel, Southampton, in order to elect area officials. The Association, which watches the interests of ground engineers, was recently reorganised.

Two S.B.A.C. Appointments

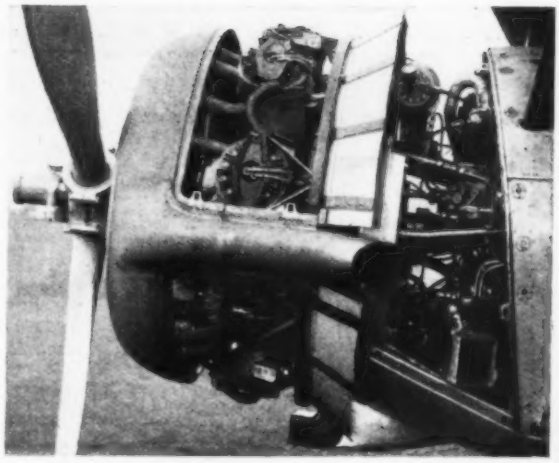
THE Society of British Aircraft Constructors announces two appointments to its staff. Sqn. Ldr. H. G. R. Malet is appointed assistant to Mr. H. R. Gillman, the secretary. Sqn. Ldr. Malet retired from the Service in 1932 and has lately been control officer at Southampton Airport. He has been in aviation for twenty-three years.

The other appointment is that of Mr. B. J. Hurren as assistant to Mr. E. C. Bowyer in the information department. Mr. Hurren, who has contributed articles to *Flight*, held a commission in the Royal Air Force from 1929 to 1934, serving with No. 2 (Army Co-operation) Squadron and the Fleet Air Arm.

Air Cadets

AT a meeting of the executive committee of the Air League of the British Empire, held at Londonderry House last week, it was decided to proceed with a scheme for forming an Air Defence Cadet Corps. A committee was appointed under the chairmanship of Marshal of the Royal Air Force Sir John Salmond, and offers of assistance were made, so that the scheme starts with sufficient capital for initial organising expenses.

In the recent Air Estimates there figured a token vote of £200, which will enable the Air Council to extend such support to the movement as may be deemed desirable.



900 HORSES AT HOME: The Perseus XII installation includes the modern Bristol refinements. The remote drive box with the generator in vertical position can be seen on the bulkhead. A note on the type-test is on p. 372.

The Aircraft Engineer

OWING to the fact that *Flight* of April 28 is the special Commercial Aircraft and Airlines Number, our technical supplement, *The Aircraft Engineer*, will be published one week earlier than usual, i.e., in *Flight* next Thursday, April 21.

In Appreciation

"MOST big flights develop into wrangles. In this one there hasn't been a cross word. Nobody has got hot under the collar."

These words, by a speaker at a dinner on Friday evening, exactly sum up the Clouston-Ricketts New Zealand flight. The very pleasant spirit which has animated the whole record from start to finish was manifest at this same dinner, which was given at the Royal Clarendon Hotel, Gravesend, by F/O. Clouston and Mr. Ricketts to the staff of Essex Aero, Ltd., which concern, under the control of Mr. Jack Cross and his co-director, Miss Ivy Teesdale, has lavished fatherly care on the Comet G-ACSS since before the Damascus Race.

The two pilots had invited the staff and the thirty-odd employees (with their wives or other attachments) down to the most junior mechanic. Not content with this, they presented each and every employee with a tankard, while Mr. Cross and Miss Teesdale likewise received mementoes.

The whole affair was capital fun. Speeches—bright, but too numerous and too long to report—were made by Messrs. Clouston and Ricketts, Cross, Harry Hall, E. Mulder, Miss Teesdale and Mr. G. MacAlpine, London representative of the *Sydney Daily Telegraph*, which sponsored the flight; his was one of the longest, yet also one of the funniest we have ever heard. He also presented Messrs. Clouston, Ricketts and Cross with most imposing ashtrays bearing a silver Comet.

The happiest guest of all was a gentleman named Chota, who spent the evening under the table, after accepting far too much hospitality from far too many people. It should, perhaps, be added that Chota is Mrs. Clouston's daschund.

COMMERCIAL AVIATION TO-DAY

WITH British commercial aviation receiving the long-hoped-for "new deal" as an outcome of the Cadman Report, considerable expansion may be expected in the near future.

The present and future position will be fully reviewed from various angles in a Special Issue of FLIGHT appearing in a fortnight hence. This, the COMMERCIAL AIRCRAFT AND AIRLINES NUMBER, will deal with the British airliners and other operating equipment now available; it will review the activities of British airline companies; and it will show the present lay-out of the world's airlines by means of a large map specially prepared by FLIGHT artists. In addition, there will be authoritative articles on various aspects of commercial aviation.

FLIGHT

THURSDAY, APRIL 28.

HERE AND THERE (CONTINUED)

Steam Aero Engines?

THE idea of using steam engines for aircraft propulsion is, of course, as old as flying itself. In fact, a Manley steam engine was used in the Langley "Aerodrome," and a steam plant was used by Sir Hiram Maxim in his earliest tests in this country.

More than ten years ago the American National Advisory Committee for Aeronautics examined the problem very thoroughly, and came to the conclusion, as stated in Technical Note No. 239, that on a weight basis the steam power plant was excluded; that on a fuel-economy basis it was excluded; that on a basis of drag of cooling surfaces it was excluded; and that on a basis of the sum of these three it was quite hopeless.

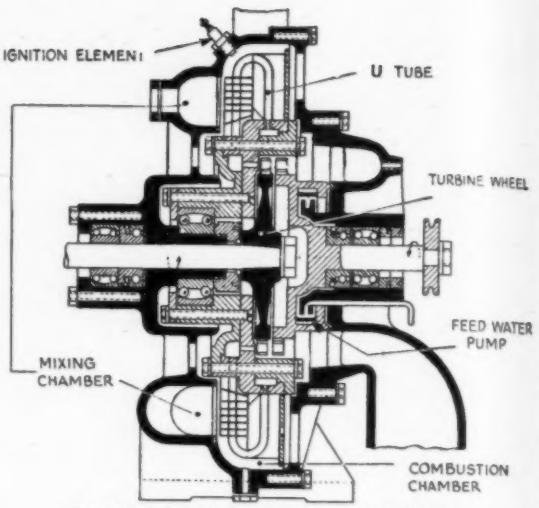
That progress has been made since then will be granted, when the claim is made that a 2,000 b.h.p. steam plant can now be built for aircraft, with a specific weight of approximately 2 lb./h.p. and a fuel consumption of 0.35 lb./b.h.p./hr. Yet those are the claims advanced by the designers of a prime mover for the exploitation of which a company is stated to be about to be formed.

Recently *Flight* had an opportunity to see a demonstration of one-half of this power plant, in the form of a rotary boiler. The other half is preferably a steam turbine incorporated within the same casing, although for relatively low powers, in which the turbine is known to be rather inefficient a reciprocating steam engine could be used.

The general principle is simple enough: It includes a boiler of the rotary type, with U-tubes having their open ends connected with the water pump and steam passage to the turbine respectively. The turbine is within the same casing, and when the turbine has once been started rotating by a small extraneous motor, electric or other, and has generated a certain amount of steam, it is self-driven on account of the reaction of the steam jets impinging upon the vanes of the turbine. The two rotate in opposite directions. A small rotary pump feeds the water to the boiler, but very little power is absorbed by the pump, as the quantity of water carried is very small indeed.

Fuel oil of almost any sort can be used, and a combustible mixture is passed through a series of holes in an annular mixing chamber into the combustion chamber, in which it is ignited by an electrically heated wire.

At the demonstration cold water was fed to the boiler and in about 65 seconds the steam gauge indicated 25 lb./sq. in. The fuel was turned off and cold water was fed to the boiler with no disastrous results. Then the fuel was turned on and the boiler started again. The particular boiler, it might be mentioned, was capable of an output of approximately 30 h.p.

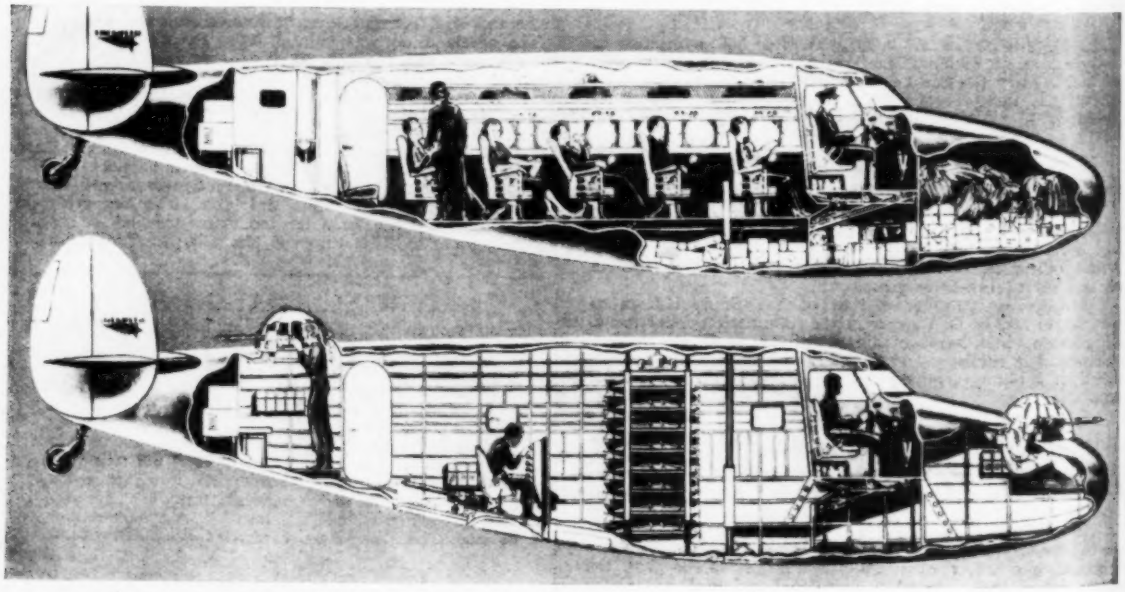


A section through the steam unit described here.

With all steam plants built so far, the condenser has been the great problem. It is claimed for this new plant that the rotary boiler can be used as a condenser. During the development period a boiler was, it is claimed, run at various speeds up to a peripheral speed of 830ft./sec. and providing pressures up to a maximum of 150 atmospheres. The maximum heat transmission capacity at maximum velocity was 553,000 B.Th.U./sq. ft./hr. When the same unit was run as a condenser, at the same maximum speed, the maximum heat transmission was found to be 203,000 B.Th.U./sq. ft./hr.

Accepting the figures given, there is still the difficulty of airscrew gearing. We are informed that in a 2,000 h.p. unit the turbine would probably be run at about 10,000 r.p.m. and the boiler at something like half that speed. One may imagine a twin-screw arrangement in which one airscrew is driven by the boiler and the other by the turbine, but the reduction gears are likely to present fairly serious problems.

For certain political reasons, the designers of the new steam plant desire to remain anonymous, but anyone interested can obtain further information from Aero Turbines, Ltd., 61, Crutched Friars, London, E.C.3. This address may be familiar to our readers as that also of Mr. J. McEwan King, of Deekay Aircraft Corporation, Ltd.



PLOUGHSHARE AND SWORD: Civil and military versions of the Lockheed 14 monoplane, sometimes called the Zephyr. The transport machine does over 260 m.p.h. with two Cyclone Gs; turrets will detract from the performance. The bomb stowage is interesting, an advantage being that only a comparatively small hole has to be cut in the skin covering of the fuselage for the bombs to make their exit.

THE INDUSTRY

Aircraft Equipment on Show : Saro Reorganisation : Personalities

Plessey Products Exhibited

TO the lay ear the name Plessey normally produces a purely radio reaction, but anybody outside the aircraft industry who happened, by accident or otherwise, to walk into the Park Suite at Grosvenor House in the middle of last week would have discovered that, though still a large item in the company's range of products, wireless equipment is by no means all-important.

The Plessey's association with the American Breeze Corporations and others has brought a very large number of interesting items of aircraft equipment to the British market. Newest of all, perhaps, is the Coffman starter, which is now standardised on a number of aircraft engines. This starter is of the cartridge type, but the effect is not at all that to which we have been accustomed in the past. The cartridge is, in fact, of the slow-burning type and the expanding gases force up a piston which, through a quick thread, drives the engine through a complete revolution.

The starter is produced in two forms, one of which, the "M" type, carries a single cartridge unit, while the other, the "L" type, carries a battery of five cartridges in a revolving breech. The two types weigh 25lb. and 35lb. respectively, and the working parts are self-lubricating. Needless to say, the firing is remotely controlled through a switch on the dashboard and the repeater type is reloaded through a Bowden control arranged in a convenient position.

In the little exhibition, too, were examples of the Breeze exhaust gas analyser for mixture control, of the elevator and rudder tab control which may be installed either with chain and cable or torque-tube drive, and the now well-known screening harness in different forms for various standard engines.

In the section devoted to Pesco pumps there was exhibited a very complete range of fuel, vacuum and hydraulic impellers. Most interesting of these was the combined vacuum and hydraulic unit designed to provide the power for both the automatic pilot and the blind-flying instruments, and a pump built in unit with a small electric motor installation in more remote parts of a machine. Although such a unit was not actually on show, these pumps can also be arranged with gear box drive as an 8-pump unit whereby all the necessary auxiliary power is centralised and the drive taken from one point.

Finally, there were, of course, examples of aircraft radio transmitters and receivers, the first with frequency ranges of 15-100 metres and 500-1,500 metres with a remote control system and arrangements for presetting, and the second of the D/F type.

Mr. J. A. McLean

ON his retirement, after twenty-one years' association with the Westland Aircraft Works at Yeovil, during the greater part of which time he acted as commercial manager, Mr. John A. McLean was presented by his colleagues with a clock as an expression of their esteem. The ceremony was performed by Mr. A. Davenport, chief designer.

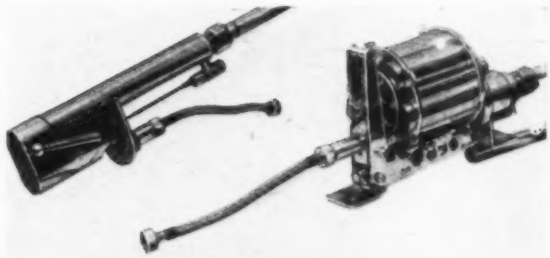
Saunders-Roe Reorganisation

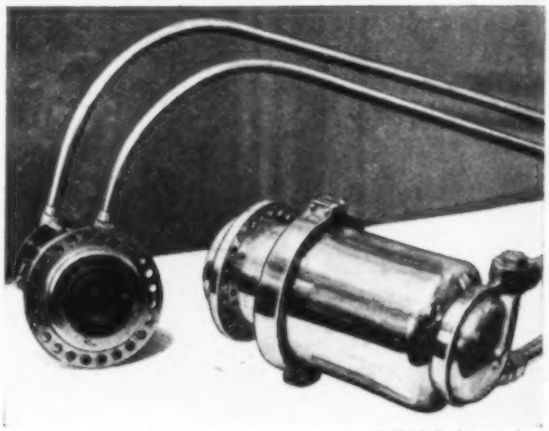
A REORGANISATION of the commercial and administrative sides of Saunders-Roe, Ltd., Isle of Wight, is announced. The following changes are taking place:—

First, the marine section, consisting of the shipyard and boatbuilding business, has been transferred to a new company, Saunders Shipyard, Ltd., all of the shares of which are owned by Saunders-Roe, Ltd. Mr. C. Inglis has been appointed shipyard manager.

Secondly, the plywood section of the business carried on at the factory on Medina River has been transferred to a new company, Saro Laminated Wood Products, Ltd., in consideration for a majority of the shares therein. Laminated Wood Products, Ltd., which hitherto has marketed the major portion of the plywood output, has also merged its interests into the new company, which will now be responsible both for production and sales. The management of the plywood works will continue under the direction of Mr. Miskin, who joins the board of Saro Laminated Wood Products, Ltd., with Mr. Scroggs as joint general manager.

Thirdly, Major Darwin, hitherto managing director, has left the company. On the aircraft side of the business Mr. Broadsmith remains director and general manager, and it is intended to appoint a further executive director. All other senior posts in the executive staff remain unchanged.





"Flight" photographs

Beginnings and Endings: Above are two types of Coffman starter shown at the Plessey exhibition. On the left is the cartridge breech of the standard type and, on the right, the remote-control magazine breech. The lower photograph shows the rotating unit of each type

A.G.S. Posts

IT is stated that Mr. F. W. Broughton is no longer connected with Aircraft General Supplies, Ltd., of Hanworth. Mr. A. S. Beresford has been appointed secretary.

Comets and Cars

F/O. CLOUSTON and Mr. Victor Ricketts have purchased two Wolseley cars, a 25h.p. drop-head coupé and an 18-80 saloon, from Eustace Watkins, Ltd., the Wolseley distributors in London.

The Rayoid Process

THE address of the Rayoid Manufacturing Co., Ltd., who, as related last week, are handling a new airscrew treatment process, is 79, Lombard Street, London, E.C.3—not 97, Lombard Street.

Air Committee at Bristol

SOME forty members of the Parliamentary Air Committee from both Houses last week visited the Bristol Aeroplane Company's works. They saw the Blenheim is mass production, inspected the flying school, and were conducted round the aero engine department, in the experimental section of which they saw the Hercules sleeve-valve.

"Approved" Chromium Deposition

IT is announced that Fescol, Ltd., have received approval for A.I.D. inspection at their new works at North Road, London, N.7, while their reconstructed premises at Grosvenor Road, London, S.W.1, have also been approved. Chromium deposition work for the aeronautical industry is now being done on a large scale at both places.

The Grosvenor Road works were considerably damaged by fire some time ago and, as is usual in such cases, approval was automatically withdrawn.

THE INDUSTRY (CONTINUED)

The Comet's Manifolds

THE provision of a corrosion-resisting material for exhaust manifolds has always been a problem, and it is interesting to hear that Iconel, the special alloy made for such purposes by Henry Wiggin and Co., Ltd., of Thames House, Millbank, London, S.W.1, was used in the record-breaking D.H. Comet.

Essex Aero, Ltd., have told the makers in a letter: "The Iconel which you supplied to us . . . has been very successful. We have been unable to trace a fault in either of these manifolds, in spite of the extremely high duty which they have been called upon to give."

Useful Wire Mesh

A CATALOGUE recently issued gives details of "Prana" woven wire mesh covering for pressure containers, tubing, hose and cable, etc. It is produced by Sparklets, Ltd., who, it is stated, have forty years' experience in the manufacture of such material, notably in the production of coverings for the famous "Sparklet" syphon. Extreme flexibility, resistance to high internal pressures, and good non-corrosive qualities are among the advantages claimed. Flat woven strip for electrical conductors is also produced.

Sparklets, Ltd., who have a factory at Edmonton, London, are a subsidiary of the British Oxygen Co., Ltd., and their offices are at Thames House, Millbank, London, S.W.1.

Resistance Welding

RESISTANCE welding is finding increasingly wide application, particularly for sheet-metal work as found in the aircraft and automobile industries.

A paper on the subject, recently presented by Dr. F. R. Hensel to the Institute of Welding, offers much useful information for those interested in the process. Reprints (containing many illustrations) may be obtained from the firm to which Dr. Hensel is consulting metallurgist—Mallory Metallurgical Products, Ltd., Waddon Factory Estate, Croydon, Surrey.

One of the problems of resistance welding is that of ensuring a sufficiently long working life for the highly stressed electrode materials. The Mallory series of hard, high-conductivity alloys last, it is claimed, from three to twenty times longer than copper, while their resistance to "mushrooming" ensures uniform electrode pressure and current density.

PUBLICATIONS RECEIVED

Notes on Supercharging for Ground Engineers, by C. E. Jones; 3s., Sir Isaac Pitman & Sons Ltd.

Report on Civil Aviation in Australia and New Guinea, 1936-1937. The Civil Aviation Board, Department of Defence, Melbourne, Australia.

The Chosen Instrument, by Norman Macmillan, 5s., John Lane, The Bodley Head, Ltd.

Aeroplane Design, by E. W. C. Wilkins, 20s., Charles Griffin and Co., Ltd., 42, Drury Lane, London, W.C.2.

Banners Yellow, by J. E. Gurdon, 7s. 6d., George Newnes, Ltd.

Doomed Flight, by J. Railton Holden, 7s. 6d., George Newnes, Ltd.

How to Become an Air Pilot, by Capt. R. L. Preston, 5th edition, 3s. 6d., Sampson Low, Marston and Co.

Aircraft Radio, by D. Hay Surgeoner, 12s. 6d., Sir Isaac Pitman and Sons.

Machine Drawing for Students, by F. J. Pryer, 3rd edition, 7s. 6d., Sir Isaac Pitman and Sons.

Gesammelte Vorträge der Hauptversammlung 1937 der Lilienthal-Gesellschaft für Luftfahrtforschung; E. S. Mittler and Sohn, Berlin.

Report on the Health of the Royal Air Force for the Year 1936; 2s., H.M. Stationery Office.

Handbook of Aeronautics. Vol. 2: Aero-Engines, Design and Practice, by Andrew Swan; 25s., Sir Isaac Pitman and Sons.

Journal of the Royal Air Force College, Spring, 1938. Cranwell, Lincs.

National Advisory Committee for Aeronautics: Report No. 601: Torsion Tests of Tubes, by A. H. Stang, W. Ramberg and G. Back, 10 cents. No. 602: Wind-Tunnel and Flight Tests of Slop-Lip Ailerons, by J. A. Shortal, 15 cents. No. 604: Pressure Distribution Measurements at Large Angles of Pitch on Fins of Different Span-Chord Ratio on a 1/40-Scale Model of the U.S. Airship "Akron," by J. G. McHugh, 10 cents. No. 605: Résumé and Analysis of N.A.C.A. Lateral Control Research, by F. E. Weick and R. T. Jones, 15 cents.

No. 606: Electrical Thermometers for Aircraft, By J. B. Peterson and S. H. J. Womack, 10 cents. No. 607: Spinning Characteristics of the XN2Y-1 Airplane Obtained from the Spinning Balance and Compared with Results from the Spinning Tunnel and from Flight Tests, by M. J. Bamber and R. O. House, 10 cents. No. 608: Stress Analysis of Beams with Shear Deformation of the Flanges, by P. Kuhn, 10 cents. No. 610: Tests of Related Forward-Camber Airfoils in the Variable-Density Wind Tunnel, by E. N. Jacobs, R. M. Pinkerton and H. Greenberg, 15 cents. No. 611: Wind-Tunnel Investigation of Tapered Wings with Ordinary Ailerons and Partial-Span Split Flaps, by C. J. Wenzinger, 10 cents. All from Superintendent of Documents, Washington, D.C., U.S.A.

The Royal Air Force Quarterly, January, 1938 - 5s., Gale and Polden, Ltd., Wellington Works, Aldershot.

"603." 1937. No. 603 County of Edinburgh (Bomber) Squadron.

Air Publication 29: Royal Air Force Flying Training Manual, Part 1—Landplanes: 6s., H.M. Stationery Office, Kingsway, London, W.C.2.

The British Journal Photographic Almanac, 1938: 2s., Henry Greenwood and Co., Ltd., 24, Wellington Street, Strand, London, W.C.2.

The Blue Book: The Electrical Trades Directory and Handbook, 1938; 25s., Benn Bros., Ltd., Bouverie House, Fleet Street, London, E.C.4.

Report on the Progress of Civil Aviation in India, 1936-37; 1s. 9d., Manager of Publications, Delhi, India.

"Elektron" Magnesium Alloys; 10s. 6d., F. A. Hughes and Co., Ltd., Abbey House, Baker Street, London, N.W.1.

Heft 26: Flugfunkwesen, Teil I. Physikalische Grundlagen der Funktechnik, Karl Möbius. C. J. E. Volckmann Nachf. E. Wette, Berlin-Charlottenburg 2, Germany.

International Index to Aeronautical Technical Reports, 1937; 5s., Sir Isaac Pitman and Sons, Ltd.

NEW COMPANIES

In the notes below, for reasons of space, the "objects" of new companies are usually somewhat abbreviated.

AERO ENGINEERING PLANNING AND EQUIPMENT CO., LTD.—Private company, registered March 2. Capital, £100 in 100 shares of £1 each. Objects: To carry on business as ironfounders, steel makers, engineers, manufacturers of and dealers in aircraft, etc. The directors are: John Roper and William Jones. Registered Office: Cutis House, Poplar Road, Solihull, Warwickshire.

GRIEVE AND GRAY, LTD.—Private company, registered March 12. Capital, £1,600 in 1,600 ordinary shares of £1 each. Objects: to acquire the business of Grieve and Gray carried on at 112a, High Street, Harlesden, N.W.10, and to carry on the business of woodworkers, manufacturers of and dealers in aeroplanes and other aircraft, etc. The directors are John V. Grieve and Leonard A. Gray.

AERIAL FILMS (SCOTLAND) LTD.—Private company, registered in Edinburgh March 16. Capital, £200 in £1 shares. Objects: to carry on the business of photography in all its branches, etc. The directors are James M. Lawson, 129, Novar Drive, Glasgow, W.2, and Robert G. Lawson.

CHANGE OF NAME

HAMPSHIRE AEROPLANE CLUB, LTD. (Southampton Airport, Southampton).—Name changed to Hampshire School of Flying, Ltd., on March 12, 1938.

INCREASES OF CAPITAL

DEEKAY AIRCRAFT CORPORATION, LTD., 61, Crutched Friars, London, E.C.2.—The nominal capital has been increased by the addition of £2,000 in £1 ordinary shares beyond the registered capital of £10,000.

NOTTINGHAM AIRPORT, LTD., Tollerton Aerodrome, Notts.—The nominal capital has been increased by the addition of £2,000 in £1 shares beyond the registered capital of £3,000.

NUFFIELD MECHANISATIONS AND AERO, LTD., Common Lane, Washwood Heath, Birmingham, 8.—The nominal capital has been increased by the addition of £100,000 in £1 ordinary shares beyond the registered capital of 110,000.

SAUNDERS SHIPYARD, LTD., Cornubia Shipyard, Clarence Road, East Cowes, I.O.W.—The nominal capital has been increased by the addition of £34,900 in £1 ordinary shares beyond the registered capital of £100. This increase is for the purpose of acquiring part of the undertaking of Saunders-Roe, Ltd.

DEEKAY AIRCRAFT CORPORATION LTD. (61, Crutched Friars, London E.C.3).—The nominal capital has been increased by the addition of £8,000 in £1 ordinary shares beyond the registered capital of £12,000.

F. J. HOLDINGS LTD., 18, Austin Friars, London, E.C.2.—The nominal capital has been increased by the addition of £900 in £1 ordinary shares beyond the registered capital of £100. This increase is for the purpose of acquiring (a) the entire issued share capital of The Gloster Aircraft Co. Ltd. and (b) not less than 90 per cent of the issued share capital of Hawker Aircraft Ltd.

MARTIN HEARN, LTD. (Aeronautical Engineers, etc., Merseyside Air Park, Hooton, Ches.).—The nominal capital has been increased by the addition of £1,500 beyond the registered capital of £500.

BLACKBURN AIRCRAFT, LTD. (Brough, E. Yorks.).—The nominal capital has been increased by the addition of £220,000 beyond the registered capital of £630,000.

HORDERN-RICHMOND AIRCRAFT, LTD. (28, Berkeley Street, London, W.1).—The nominal capital has been increased by the addition of £5,000 beyond the registered capital of £10,000.

NORTH-EASTERN AIRWAYS, LTD. (Airport of London, Croydon, Surrey).—The nominal capital has been increased by the addition of £50,000 in £1 ordinary shares beyond the registered capital of £50,000.

AERONAUTICAL PATENT SPECIFICATIONS

(*Published March* 31, 1938.)

17456. SPERRY GYROSCOPE CO., INC.: Automatic steering-gear for aircraft (480,776).

24361. DANIEL, P. G. L.: Wing or water wheels for use as prime movers, propellers, or as sustaining devices for aircraft (481,014).

25933. ČESKA ZBROJOVKA AKCIOVA SPOLECNOST V PRAZE: Synchronising means for machine guns firing through the propeller circles of aircraft (481,033).

31190. SAULNIER, R.: Pumps for aircraft machinery (480,975).

34443. FAIREY AVIATION CO., LTD., and FORSYTH, A. G.: Electric switches for controlling the extent of travel of electric motors (480,983).

5709. FAIREY AVIATION CO., LTD., and VOSS, E.: Quick release pin (480,998).

7961. SHORT BROS. (ROCHESTER AND BEDFORD), LTD., and MCVIE, R.: Means for folding monoplane wings (481,050).

9655. ETABLISSEMENTS VERBOOM ET DUROUCHARD: Devices for removing seaplanes and other similar machines from the water (480,923).

10889. SHORT BROS. (ROCHESTER AND BEDFORD), LTD., and SHEPHERD, P.: Method of covering aircraft wings surfaces and bodies (481,058).

13893. PRAUZLER, J.: Automatic machine-gun carriers adapted to be dropped from aircraft (481,066).

20931. SHEVLIN, J. T. (Siemens Apparate und Maschinen Ges): Instrument boards for aircraft (480,849).

(*Published April* 7, 1938.)

22537. DOWTY, G. H.: Means for lifting, lowering or supporting aircraft (481,288).

24428. BINKS, C. L., and AMAL, LTD.: Fastening devices for aeroplane cowlings and like covers (481,361).

24823. REISSNER, H., and ARGUS MOTOREN GES: Variable-pitch screw propeller for aircraft (481,519).

25042. DOWTY, G. H.: Retractable undercarriages for aircraft (481,449).

25528. LINK, JUN., E. A.: Apparatus for training aviators (481,375).

33382. CASPAR, F. A., and PAK PARACHUTE CO., LTD.: Method of folding parachutes (481,455).

15574. SARAZIN, R. R. R.: Torque indicator (481,240).

21141. BELLEZE CORPORATIONS, INC.: Fuel tanks for airplanes (481,406).